MECHANICAL HANDLING

INCORPORATING 'MATERIALS HANDLING'

VOLUME 47 NUMBER 11 NOVEMBER 1960

CONVEYING PASSENGERS

To thousands of workers in the City of London, September 27th last proved to be a momentous day. For some years now their daily morning and evening journeys have been made under conditions of utmost discomfort, which have grown progressively worse as time passed. We refer, of course, to the congestion that has existed on the short section of underground railway running between Waterloo station and the Bank, commonly referred to as the 'Drain'. During peak-hour traffic, over 13,000 people travel in one direction on this line and congestion has been caused, in the main, by a 'bottleneck' created at the Bank end by a long narrow pedestrian subway connecting the railway platform with the road surface, there being no form of lift or escalator.

On the date mentioned, conditions were completely changed by the introduction of the 'Travolator', claimed as the world's largest moving footpath, and Europe's first. Planned to handle 20,000 people/hr it rises 42 ft in its length of 297 ft and travels at a speed of 180 ft/min.

Due credit must be given to British Railways in their solving of one of London's worst railway traffic problems by the installation of a system that is not only most up to date in conception but has never been used before on such a large scale, at least on the continent of Europe. In view of its success it may well be asked why this application of mechanical handling to the large-scale movement of personnel has now shown more rapid development, particularly when it is remembered that acute pedestrian traffic congestion in some form or other will be found to exist in most cities throughout the world. Congestion is also always likely to occur wherever pedestrians concentrate as, for example, at airports, seaports, sports stadiums, exhibitions, shopping centres, etc.

The idea of moving pedestrians by means of a conveyor belt is of course by no means new, as was amply borne out by a recent correspondent in a London newspaper who recalls travelling on a 'moving staircase' at the Crystal Palace 60 years ago; this did not have steps but was a continuous flat belt, which raised visitors from ground level to the galleries. In fact, five years after the Waterloo and City line railway was opened a Leeds firm prepared a scheme plan for an identical form of transporter for use on this site, which was abandoned probably because the tunnel was crooked.

Reference has also been made in these pages from time to time to installations in various parts of the world, to the research and development being carried out in connection with passenger conveyors and to equipment offered by various organizations. The fact remains, however, that there are still few in operation and, of those, only one or two have approached the magnitude of London's new Travolator. To quote the author of one of our articles, perhaps it is 'economics allied to opportunity, rather than engineering expertize which are the limiting factors to the development of passenger conveyors'. Whatever the reason may be there can be no doubt that world-wide attention has been focused upon this new and outstanding installation and it is only to be hoped that the potentialities of this system will be exploited to the full and that manufacturers and others concerned will be quick to take full advantage of the opportunities so offered. A full description of London's Travolator will appear in our next issue.

Pour les lecteurs de l'étranger
Für unsere ausländischen Leser
Para los lectores de ultramar

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For readers overseas

Manutention du thé à l'Entrepôt de Manchester de la Brooke Bond page 740
Par Frederick Gronback
Du fair même de la nécessité d'un isolement strict, il n'est pas possible de manutentionner le thé comme produit en vrac, sauf aux premiers stades dès l'arrivée à l'entrepôt. Dans cet article, l'auteur décrit les problèmes de manutention particuliers et spéciaux concernant les caisses de thé en contreplaqué, au dépôt de Manchester de la Brooke Bond Tea Ltd.

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SOMMAIRE EN FRANÇAIS

Montage en série des téléviseurs page 704
Par P. M. Sanders, M.I.Mech.E., M.Inst.T.
Pour répondre aux exigences modernes, la fabrication en grande série des téléviseurs nécessite un système et un mode d'implantation d'équipement de manutention mécanique qui, dans les diverses conditions de rendement, non seulement puisse assurer un montage, un contrôle, des essais et un emballage rapides et correctement exécutés, mais encore un degré de souplesse pouvant accepter des modifications de modèles. Cet article décrit les dernières opérations de fabrications à l'usine E. K. Cole, Ltd., de Southend-on-Sea.

Une nouvelle installation pour le criblage, le stockage et le triage automatique page 711
Utilisées pendant des siècles comme matériaux de construction, les roches ignées du Leicestershire ont mérité leur grande réputation de résistance. La Cliffe Hill Granite Co., Ltd., extrait à peu près 1.422 tonnes de pierre par jour, et les transforme en matériaux tels que la pierre enrobée, le béton prémalaxé, pierraille pour les routes, agrégats, ballast pour voies ferrées, matériaux filtrants, etc., etc.

Un seul chariot à portée dessert un grand dépôt nouveau page 717
Un nouveau dépôt construit à Bristol par Oxo Limited assure les besoins d'une grande zone de la région ouest et sud-ouest de l'Angleterre. Les marchandises emballées sont livrées à ce dépôt par de lourds véhicules routiers, puis elles y sont emmagasinées pour distribution ultérieure en faibles quantités aux magasins, boutiques et distributeurs. Un seul chariot à portée sert à manutentionner tous les produits du poste d'arrivée au dépôt, en passant par l'entrepôt pour aller à la section d'emballage.

Un constructeur de grues et un constructeur de navires s'allient pour réaliser la préconstruction à grande échelle page 720
Cet article décrit les travaux de modernisation que l'on a exécutés aux Chantiers de Birkenhead de la firme Cammell, Laird & Co., Ltd., constructions navales. Entre autres nouveaux matériels et équipement, la Butters Bros. & Co., Ltd., a installé un pont roulant monotour électrique de 100 tonnes, qui a une charge nominale maximum de 100 tonnes à rayon de 37,2 mètres, en reposant librement sur une voie ferrée à rails espacés de 16,7 mètres. Cet engin serait le plus gros pont roulant de ce type qui existe dans le monde entier.

Installation pour béton préparé d'avance page 727
Un haut degré d'automation vient d'être intégré à un nouveau materiel à Londres, qui est prévu pour un rendement de 1150 mètres cubes de béton tout mélangé par jour.

Version Anglaise du tracteur-pelle 'Trojan' *par K. Mumby* page 729
Avec la première version anglaise du tracteur-pelle américain Trojan, la Section Anglaise de Manutention des Matériaux de la Yale & Towne Manufacturing Co. aborde le domaine des travaux de terrassement. Le 154 LD, d'une force de levage de 5.443 kg et une benne d'utilité générale de 1,5 mètre cube de capacité, est actuellement en cours de production. Il est actionné par un moteur diesel 6 cylindres de 105 CH. et doté d'une transmission automatique et d'un convertisseur de couple.

Démonstration de transporteurs élévateurs à fourche à fonctionnement latéral pour durs travaux page 737
On annonce que le Laminoir de Poutres Universel Lackenby, de la firme Dorman Long (Steel), Ltd., serait la plus grande installation d'Europe at la plus moderne du monde, avec une production prévue de 10.160 tonnes par semaine. Cet article expose la manutention des poutres d'acier, pouvant avoir de 0,9 mètres à 0,15 mètres de profondeur et jusqu'à 18,3 mètres de longueur, à l'aide de transporteurs élévateurs à fourche Traveloader à fonctionnement latéral, d'une capacité de 15 tonnes.

INHALTSÜBERSICHT AUF DEUTSCH

Serienmontage von Fernsehempfängern Seite 704
Von P. M. Sanders, M.I.Mech.E., M.Inst.T.
Um den neuzeitlichen Belangen der Serienfertigung von Fernsehempfängern gerecht zu werden, ist eine Anlage und Anordnung von Förder—und Hebegeräten erforderlich, die unter schwankenden Ausstossverhältnissen nicht nur eine schnelle und einwandfreie Montage, Kontrolle, Prüfung und Verpackung, sondern auch ein Mass an Flexibilität gewährleistat, welches es mit konstruktionstechnischen Änderungen aufnehmen kann. Im vorliegenden Artikel werden die abschliessenden Fertigungsabläufe im Werk der Fa. E.K. Cole Ltd. in Southend-on-Sea beschrieben.

Eine neue Anlage für Sichten, Lagern und automatische Klassifizierung Seite 711
Bereits seit Jahrhunderten als Baumaterial angewandt ist das Massengestein der Grafschaft Leicestershire für seine Dauerhaftigkeit und Festigkeit weit und breit bekannt. Etwa 1400 to Gestein werden täglich von der Fa. Cliffe Hill Granite Co., Ltd. abgebaut und u.a. zu unterschiedlichem Stein, Fertigmischbeton, Strassensplitt, Aggregat, Eisenbahnschotter, Filter material usw. verarbeitet.

Ein Auslegerfahrzeug bedient grossen neuen Lagerplatz Seite 717
Ein neues von der Fa. Oxo Limited in Bristol errichtetes Zentrallager beschickt ein grosses Gebiet im Westen und Südwesten Englands. Die Waren werden bündelweise von schweren LKWs zugebracht, gelagert und dann in geringen Mengen an Geschäfte, Warenhäuser und Vertriebsstellen verteilt. Ein einziger Auslegerwagen wird für den Umschlag sämtlicher Waren von der Annahmestelle

im Lager durch die Speicher und Verpackungsabteilung eingesetzt.

Kran- und Schiffbauer vereinigen sich zur Erzielung einer Vorfertigung in grossem Stil Seite 720
In diesem Artikel wird die Modernisierungsarbeit beschrieben, die in der Schiffswerft Birkenhead der Fa. Cammell Laird & Co., Ltd. stattgefunden hat. Unter den neuen Anlagenteilen wurde u.a. von der Fa. Butters Bros. & Co., Ltd. ein 100-t-Elektroturmfahrkran mit einer Nennhubkraft von 100 to bei einer Auslandung von 37,2 m bei unabgestützter Aufstellung auf Eisenbahnschienen mit 16.7 m Gleisabstand errichtet. Er soll der grösste Kran dieser Bauart in der Welt sein.

Fertigbeton-Mischanlage Seite 727
Eine weitgehende Automatisierung wurde in einer neuen Londoner Fabrik eingeführt, in welcher täglich etwa 1150 m³ Fertigmischbeton hergestellt werden sollen.

Britische Ausführung des Schürfladers 'Trojan' Seite 729
Von K. Mumby
Mit der ersten britischen Ausführung des amerikanischen Schürfladers 'Trojan' ist die British Materials Handling Division der Yale & Towne Manufacturing Co. in das Gebiet des Erdbaus eingestiegen. Das Modell 154 LD mit einer Tragkraft von 5.443 kg und einer 1.5-m³-Allzweckschaufel befindet sich nunmehr in der Fertigung. Es erhält seinen Antrieb von einem 105 PS Sechszylinder-Dieselmotor und ist mit automatischem Getriebe und Drehmomentwandler versehen.

Vorführung eines Hochleistungs-Seitengabelstaplers Seite 737
Das Walzwerk Universal Beam Mill der Fa. Dorman Long (Steel), Ltd. gilt mit seinem geplanten Ausstoss von über 10.000 to pro Woche als das grösste Walzwerk Europas und das modernste der Welt. In diesem Artikel wird über das Fördern von Stahlträgern mit Abmessungen von 0,9-0,15 m Tiefe und bis zu 18,3 m Länge mit dem 15-t-Seitengabelstapler 'Traveloader' gesprochen.

Tee-Umschlag im Lagerhaus der Firma Brooke Bond in Manchester Seite 740
Von Frederick Gronback
Wegen des Erfordernisses strenger Auseinanderhaltung kann Tee ausser in den Anfangsstadien der Ankunft im Lager nicht als Schüttgut behandelt werden. Im vorliegenden Artikel werden die Sonderprobleme beschrieben, die das Hantieren von Sperrholzkisten mit Tee im Lager Manchester der Firma Brooke Bond Tea, Ltd., mitsichbringt.

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SUMARIO EN ESPAÑOL

Montaje en masa de receptores de television Pág. 704
Por P. M. Sanders, M.I.Mech.E., M.Inst.T.
Para satisfacer las necesidades modernas, la producción de televisores en gran escala exige un sistema y construcción de equipos de manipulación mecánica que, variando el ritmo de producción y las circunstancias, no sólo asegure el rápido y correcto montaje, inspección, prueba y embalaje, sino también una cierta medida de flexibilidad que permita la introducción de modificaciones en el diseño. En este artículo se describen las operaciones finales de producción en la fábrica que tiene en Southend-on-Sea la casa E. K. Cole, Ltd.

Nueva planta para cribado, almacenaje y clasificacion automatica Pág. 711
Usadas a través de los siglos como materiales de construcción, las rocas ígneas del condado de Leicester se han conquistado una alta reputación por su fuerza y duración. Alrededor de 1422 toneladas de piedra son extraídas diariamente de las canteras por la Cliffe Hill Granite Co., Ltd., piedra que es procesada para convertirla en productos tales como piedra revestida, hormigón premezclado, gravilla para carreteras, aglomerados, balasto para ferrocarriles, elementos filtrantes, etc.

Una sola carretilla de distribución sirve un gran nuevo depósito Pág. 717
Un nuevo almacén de depósito construído en Bristol por Oxo Limited sirve a una extensa zona de la región oeste y sudoeste de Inglaterra. Las mercancías ebmaladas son entregadas en este depósito por vehículos de carretera pesados, y allí se almacenan y luego se distribuyen en pequeñas cantidades a las tiendas, grandes almacenes y distribuidores. Se usa una sola carretilla de distribución para manipular toda la mercancía desde el momento de su llegada en el depósito, pasando por el almacén hasta el departamento de embalaje.

Constructor de grúas y constructor de buques se combinan para conseguir la Prefabricacion en gran Elcala Pág. 720
En este artículo se describe el trabajo de modernización que se ha realizado en los Astilleros de Birkenhead de la Cammell Laird & Co., Ltd. Entre los nuevos elementos que figuran en las instalaciones, ha sido instalada por Butters Bros. & Co., Ltd., una grúa eléctrica monotorre de traslación de 100 toneladas, la cual tiene asignada una carga máxima de 100 toneladas a un radio de 37,2 metros mientras está libre sobre unos carriles montados a una distancia entre centros de 16,7 metros. Se afirma que ésta es la grúa más grande de su tipo que jamás haya sido construída en el mundo.

Planta de hormigón mezclado Pág. 727
Ha sido construída en Londres una nueva planta con un grado elevado de automatización, la cual ha sido proyectada para producir 1150 metros cúbicos de hormigón mezclado cada día.

Versión Británica de la pala-tractor 'Trojan' Pág. 729
Por K. Mumby
Con la primera versión británica de la pala-tractor estadounidense 'Trojan', la División Británica de Manipulación de Materiales de la Yale & Towne Manufacturing Co. se introduce en la esfera del desplazamiento de tierras. La 154 LD, con una capacidad de elevación de 5.443 kg y un cucharón de 1,5 metros cúbicos para usos generales, se halla ya ahora en producción. Es movida por un motor diesel de 6 cilindros 105 HP, y está provista de transmisión automática y convertidor de torque.

Demostracion de vehículos de transporte con horquilla elevadora de gran potencia y funcionamiento lateral Pág. 737
La fábrica de vigas Lackenby Universal de la Dorman Long (Steel), Ltd., como se sabe, es la mayor de Europa y la más moderna del mundo, con su producción proyectada de 10.160 toneladas métricas por semana. En este artículo se describe la manipulación de las vigas de acero, cuya profundidad va de 0,9 a 0,15 metros, y cuya longitud llega a los 18,3 metros, por medio de vehículos de transporte Traveloader con horquilla elevadora de funcionamiento lateral cuya capacidad es de 15 toneladas.

Manipulación de té en los almacenes que Brooke Bond tiene en Manchester Pág. 740
Por Frederick Gronback
A causa de la necesidad de su estricta separación, el té no puede manipularse en masa, como no sea en las primeras etapas después de su llegada al almacén. En este artículo los problemas especiales y peculiares de manipulación que se presentan en el movimiento de cajones de madera contrachapada conteniendo té aparecen descritos, siendo el almacén el que en Manchester tiene la Brooke Bond Tea, Ltd.

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MASS ASSEMBLY OF TELEVISION RECEIVERS

Mechanized Equipment for Final Production Operations at the Southend-on-Sea Factory of E. K. Cole, Ltd.

By P. M. Sanders, M.I.Mech.E., M.Inst.T.

LEFT
Fig. 1. Central reversible V.M.E. belt conveyor between the storage areas in the cabinet department

BELOW
Fig. 2. Conveyor taking palleted cabinets from the cabinet department to the final assembly factory

TO meet modern requirements, large-scale production of television receivers calls for a system and layout of mechanical handling equipment that under varying output conditions not only ensures rapid and correct assembly, inspection, testing and packing without confusion, but also a degree of flexibility that accommodates changes in design, variations in type and size of sets produced and freedom from structural and exterior damage. Location and arrangement of the production lines and handling plant must make economical use of the space available without obstruction of the workers, and recognize the time- and labour-saving advantages which work study can afford.

These considerations have characterized the layout and installation of the television receiver factory of E. K. Cole, Ltd., Priory Crescent, Southend-on-Sea. Planned for a very large weekly output by male and female operatives and modern equipment tailored to precise requirements, the television factory adjoins those concerned with the other well-known productions of the company. It comprises four main self-contained departments devoted to the assembly of the chassis and cathode-ray tube units, reception, unpacking, storage and preparation of the cabinets, final assembly, inspection and testing of the finished receivers and their polishing and packing in cartons for road delivery by the company's fleet of vehicles.

This article relates mainly to the equipment employed for the final assembly operations, supplied and installed by V.M.E. Conveyor & Furnace Co., Ltd., in collaboration with the Industrial Engineering Department of E. K. Cole, Ltd. All layout schemes and specifications for mechanical handling equipment are prepared by this department, and a large percentage of the equipment is manufactured within the company. Where power conveyors are called for their designs are generally left to the conveyor manufacturers, but the specifications laid down by the department are rigidly observed.

In each factory department the sequence of production operations is unidirectional except for reversals and lateral movements required for corrective treatment on roller

benches after inspection or testing and for cross-feeding conveyance. Production of the chassis-tube units is carried out in the southern portion of a divided factory about 1,000 ft long and 60 ft wide. The final assembly department occupies the northern portion, about 500 ft long, with the cabinet department, of about the same width and 250 ft long, adjacent on the western side. At the northern end of the factory, across a roadway, is the polishing and packing department.

Cabinet Preparation

The majority of the productions are 21-in and 17-in receivers, including portable models, but a considerable output of other models, differing in screen size and overall dimensions, is maintained. The cabinets without their glass fronts are delivered in cartons by van and off-loaded through a door at the north-west corner of the department. Some of the cabinets are placed on an Abisch belt conveyor along the western side and are stacked in an adjoining storage area. Cabinets are also placed on a belt conveyor of Ekco construction at the northern end that takes them to a power slat bend feeding on to a Wedco conveyor at the eastern side for storage alongside. Glass fronts are delivered in pallets at the further end on the western side and stored separately in an enclosure.

For ease of handling and reduced risk of damage throughout the whole assembly operation, every cabinet is mounted on a flat wooden pallet in the cabinet department. The pallets are removed before packing and, on delivery from the packing department, are also placed on the Ekco conveyor and taken beyond the storage area for re-fitting.

Installed longitudinally in the centre of the department and extending from near the northern end, between cabinet inspection enclosures, to beyond the storage area, is a V.M.E. belt conveyor in two reversible sections. On one section unpacked cabinets are carried to the inspection enclosures, and on the other to an installation of roller conveyors to which they are transferred for the pallets to be fitted. They are then directed by a Caslip slat bend on to a short cross conveyor, at the delivery end of which they are off-loaded on to a V.M.E. belt conveyor that takes them in correct sequence to the southern end of the final assembly factory. The two reversible sections of the central conveyor are at a low level to facilitate loading and unloading and, as excavation of the flooring to accommodate the motor and chain driving units is impracticable, these are mounted above on steel arches, allowing clearance for the largest loads handled.

Throughout the whole assembly process precautions are taken to avoid damage to the polished surfaces of the cabinets. After unpacking, they are inverted and placed upon tables covered with strips of resilient Rubisote while steel stays, affording rigidity at the open lower ends, are removed. Tygan facings are protected by the attachment of sheet polythene. Empty cartons are returned to the reception end of the building on one section of the central conveyor for despatch to the cabinet factory. On the other section the cabinets are taken to the roller conveyors, on to one of which they are transferred and inverted for drilling and attachment of the wooden pallets. For these operations they are raised to convenient height by the use of wooden stands topped with Rubisote to avoid damage. They are also fitted with the glass fronts which have previously been thoroughly cleaned in an adjoining cleaning bay. Should any have been scratched, they are reconditioned by re-polishing equipment installed alongside an enclosure where the glass is stored on special pallets.

Chassis-Cabinet Assembly

The conveyor delivering from the cabinet department terminates at a Caslip slat bend that feeds the cabinets on to

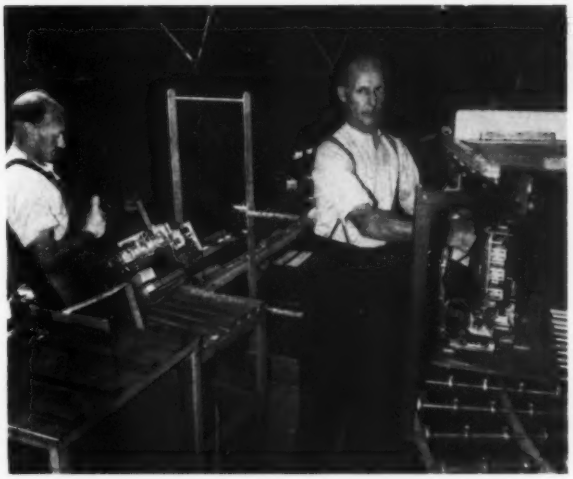


Fig. 3. Corner of the gantry where chassis and cathode-ray assemblies are lifted off the overhead chain conveyor and placed on storage rollers to be lowered to the production lines for insertion in the cabinets

BELOW

Fig. 4. One of the lowerators by which chassis-tube assemblies are brought down to the production lines from the storage gantry

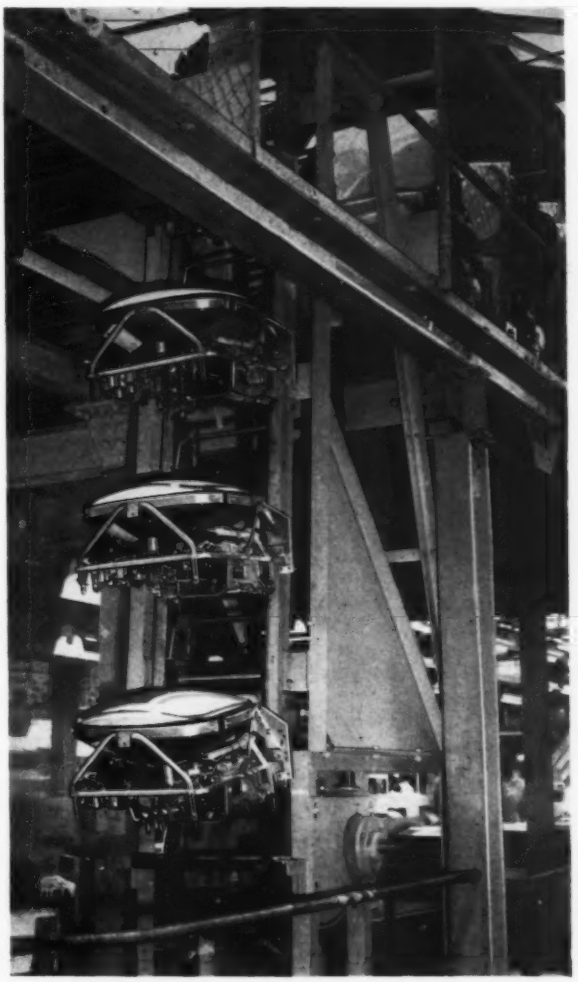


Fig. 5. Showing a chassis-tube unit about to be moved on a roller conveyor into position for assembly in a cabinet on the preparation conveyor seen on the left

a V.M.E. belt conveyor that runs alongside the southern wall of the final assembly factory and has a similar bend at the further end. They are unloaded from these, forming a float supply to the production lines that commence at that end of the department and extend to the other end where the receivers reach the finished stage ready for packing.

Final assembly is carried out on four parallel production lines, A, B, C and D. The three last-named are devoted exclusively to the 21-in and 17-in models which are produced in the largest numbers. On the C and D lines assembly operations are identical, and though on B line they are mainly the same, certain changes are necessary for portable models which are normally assembled on it. The A line is normally allocated to the assembly of large consoles and receivers which vary in assembly procedure, and flexibility of layout is essential for dealing with the many different models.

From the commencement of assembly to delivery into the packing department the conveying and other handling equipment used is mainly V.M.E., but, as referred to later, other makes of lifting and lowering equipment are installed. The palleted cabinets for C and D lines are first placed on the ends of woven wire belt preparation conveyors, electrically driven at a speed suited to the rate of output. They are equally spaced as indicated by coloured lines painted on the belting, the colour varying according to the spacing required by the operatives stationed along the lines. An advantage of the woven wire belting as compared with rubber or other material is that the receivers or components slide more freely over the surface when moved or turned.

Final fittings to the cabinets include the speaker units, omitted in the chassis assembly factory as certain variations according to type of set render selection necessary, and this is more conveniently effected at the final assembly stage. The chassis-tube assemblies are brought in from the adjoining factory suspended by hangers from a continuously running King overhead chain conveyor. Each is supported in carrier harness suspended by a spring-controlled double hook which is locked in the closed position by insertion of a steel pin. It is instantly released by withdrawing the pin and slightly raising the harness when the hook automatically opens.

On entry at the south-west corner of the factory the chassis-tube assemblies are first connected to an electrical supply system to give them an electrical soak test, designed to detect any weak component. The test is continued until they are removed from the conveyor to be fitted in the cabinets. For this purpose the assemblies pass a raised platform where an operative makes plug connection to the supply system. To prevent arcing, detrimental to the television testing carried out continuously in the factory, instead of a sliding contact, a special arrangement has been devised whereby the plug lead connection to the supply moves at the same speed as the conveyor. Connection is made to endless phosphor-bronze bands passing round two metal rollers concentric with, and rotated by, conveyor chain wheels and connected to the power supply.

The assemblies are taken off the chain conveyor by an operative on a gantry, or raised platform, erected over the B, C, and D lines. They are there held on storage roller conveyors and, in correct sequence, transferred to the ground floor, the 17-in units by manually operated lowerators built to E. K. Cole design, and the 21-in by a Martonair pneumatic hoist. On each production line they are placed on a roller conveyor and moved back to a position where they are fitted into the cabinets arriving on the preparation conveyor or taken from a float supply held alongside for selection of type as required. Completed assemblies are taken forward on the preparation conveyor for the back covers to be fitted. Chassis found to be defective are moved back on another roller conveyor to a repair area for attention as noted on attached labels. They are then moved forward again on a third conveyor for inspection and, if passed as satisfactory, moved into position for insertion into cabinets and forward conveyance.

Bundled back covers delivered at a side door are placed on an Abisch grip-faced elevating conveyor and fed on to a storage and preparation gantry also spanning the B, C and D production lines. After necessary attention, they are lowered in chutes to be attached to the receivers. Now completely assembled, the receivers are passed on to a continuously working Rollen accumulator roller conveyor from which they are fed in turn on to a ball castor-topped table for insulation testing by an operative who then moves them one by one on to a forward-inclined roller-topped table of an air-cushioned Becker hydraulic lift. By this they are automatically raised and released at a pre-set time cycle to run on to a chain conveyor system that passes along a line of seven test cabins. A faulty or badly-fitted back cover is invariably the cause of failure in the insulation test. The few receivers rejected, however, are returned to a rectification section via a short roller conveyor alongside the main belt conveyor. New back covers are fitted and the receivers are returned to the main conveyor for re-test.

Portable receiver chassis arriving by the King overhead conveyor are delivered to a receiving gantry above the front end of the B line preparation conveyor. While on this gantry, they are prepared and lowered by a Martonair air hoist to the correct station on the conveyor below for assembly to the cabinets. Of moulded plastics, produced by Ekco Plastics, Ltd., the cabinets are delivered to the line in two separate pieces, but unlike the others, they are brought to the line in special containers. After assembly the procedure is similar to that on the C and D lines.

Receiver Testing

Beside the seven test cabins on each of the production lines, B, C and D, there are two chain conveyors, one above the other, both continuously moving forward. The receivers

are fed on to the upper one and, by means of pre-set automatic devices built into the conveyor and controlling pneumatically-operated mechanism, each receiver is delivered into the test cabin automatically selected to receive it. For this side movement, rollers, and in some cases wheels, normally below the chains, raise the receiver and, like a short gravity conveyor, cause it to run on to a ball castor-topped table in the cabin. The tester immediately plugs in an electric supply lead so that it is warmed up ready for testing when the previous set has been evacuated from the ball castor-topped platform of an electrically-operated lift alongside used as the test table.

For testing sound, tuning notes and specially selected music and speech recordings are used for quality checks. For vision, a synthetic pattern signal, including test card C, is used. These signals are transmitted by cable from a central signal generator room through local distribution boards to the test cabins.

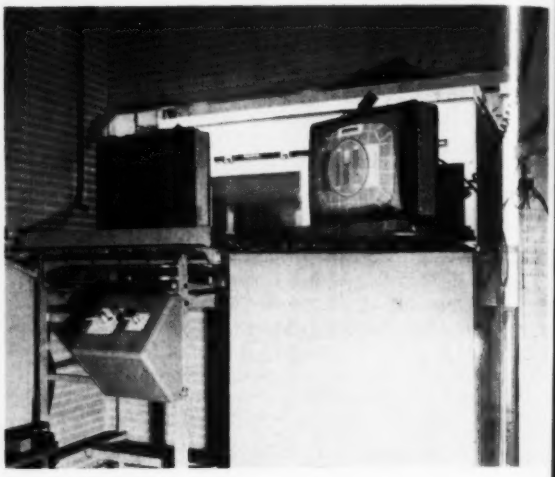
After disconnecting the supply lead, the tester moves each receiver on to the test table and turns it so that the signal is reflected in a large mirror, enabling him to manipulate the controls and observe the effects without turning his head. Each receiver, if found correct, is lowered automatically at the end of the pre-set test period or by operation of a pedal switch, until it rests upon rollers that protrude

ABOVE
Fig. 6. General view of the B, C and D line preparation conveyors as seen from the back cover gantry

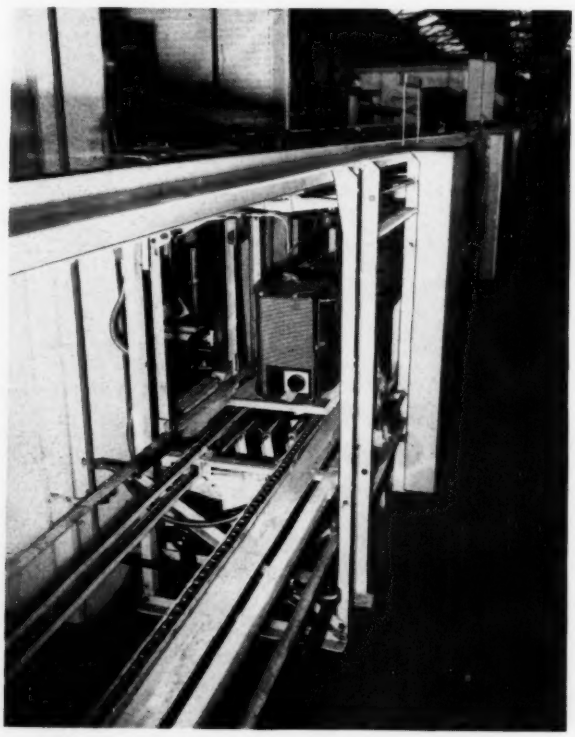
Fig. 7. General view of the B, C and D line test cabins, showing Becker hydraulic lifts that automatically load the receivers on to the chain conveyors after insulation testing. In the foreground is one of the cross roller conveyors that return repaired rejects to the insulation test position

LEFT
Fig. 8. Warmed-up receiver being disconnected from the power supply before removal to the test table shown in the lowered position about to eject a tested receiver on to the lower chain conveyor after being passed as satisfactory

BELOW
Fig. 9. Interior of a test cabin, showing receivers on the reception and test tables and controls for automatic or manual operation



BELOW
Fig. 10. Showing the rollers under the chain conveyor that lower receivers on to it if found satisfactory in the test cabin



through spaces in the lift platform. These decrease in height so that it moves out by gravity on to rollers normally below the lower chain conveyor but timed automatically to rise above it and then lower the receiver so that it is carried forward. Automatic operation or otherwise in the test cabin is determined by movement of controls below the reception table.

Rejects are moved by hand on to the upper chain conveyor and taken forward to a diagnosis position for the detection and correction of defects. They are then moved forward again and into a cabin similar to those where initial testing is conducted. There they are re-tested and, if correct, placed on the lower conveyor. If again rejected, they are replaced on the upper one to be carried to the end of the line and on to a roller bend which delivers them towards the left on to a gravity roller conveyor on which they travel at right angles and round a bend on to a long continuation in a repair section on the western side of the factory. Repairs are carried out on a long line of ball castor-topped tables. For repair the receivers are moved at right angles over a gangway on a roller wheel conveyor, a hinged section of which can be raised to give passage to the workers.

Repaired receivers are passed to an operator of a Crimpex electric elevator serving three raised roller cross conveyors, each leading on to a roller-fitted platform of a Crimpex elevator alongside one of the three insulation test tables. By operation of a selective switch, each receiver is raised and fed on to one or other of the cross conveyors and is held on the elevator platform at the further end until the insulation tester below is ready to test it. He then operates the elevator which lowers it so that he can draw it on to the test table. It is then passed through the same series of tests as it previously received.

On each production line a pre-arranged percentage of O.K. receivers are subjected to a rigorous electrical soaking on a stand alongside the conveyor to ensure stability of

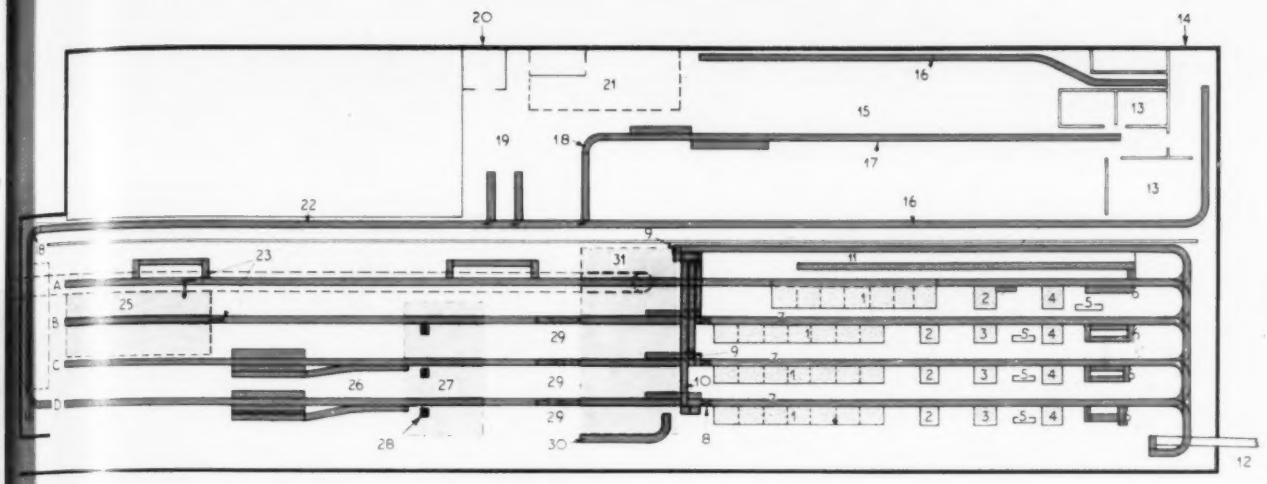
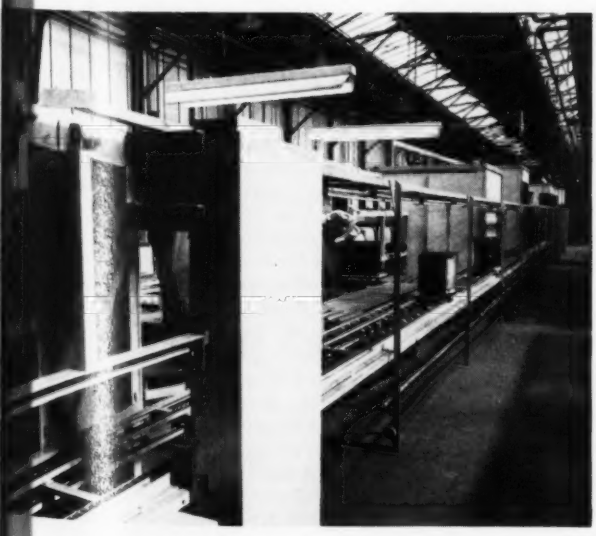


Fig. 11. General layout drawing of the cabinet preparation and final assembling departments

KEY to Fig. 11
1. Test cabins
2. Diagnosis
3. Re-test
4. Check test
5. Soak
6. Final inspection
7. Two-tier chain conveyors
8. Hydraulic lifts
9. Elevator
10. Overhead roller conveyor
11. Common electrical rectification section
12. To polishing and packing
13. Cabinet inspection
14. Cabinet delivery by road vehicle
15. Cabinet stores
16. Cabinet conveyors
17. Cabinet conveyor in two reversible sections
18. Slatted bend
19. Front glass cleaning bay
20. Glass delivery in pallets by road vehicles
21. Glass storage in special pallets
22. Cabinet delivery conveyor
23. Pneumatic hoists
24. Overhead conveyor
25. Chassis receiving gantry for A and B lines
26. Chassis preparation on roller benches
27. Chassis and tube storage gantry
28. Gantry lowerators
29. Chute
30. Inclined conveyor
31. Back cover storage and preparation gantry

Fig. 12. Looking back along a line of test cabins and upper and lower conveyors that carry forward rejected receivers and those passed as satisfactory, respectively



various components and circuits. They are then given a check test in another cabin further down the line. After final inspection, all receivers found satisfactory are carried to the end of each test conveyor where a short belt conveyor feeds them on to a chain conveyor at right angles, below that taking rejects to the repair section. On this they are delivered on to a bend and then to a position where they are loaded on to an Abisch inclined conveyor which takes them into the polishing and packing department. No major rectification or re-polishing of cabinets is carried out anywhere but in the polishing and packing department. Minor scratches, however, may be polished out previously to avoid congestion of cabinets awaiting attention.

Assembly of Larger Receivers

Chassis handled on A line are received on the King overhead chain conveyor like those for the other production lines and are subjected to a continuous electric charge. They are then removed from the conveyor at a receiving gantry situated above the beginning of the A line main assembly Wedco conveyor. The various chassis are then transferred to a roller conveyor storage rack, each type being placed on the appropriate tier. This rack, composed of tiered roller conveyors inclined to allow the chassis to run forward, holds the chassis until they are required. At the lower end of this system of gravity rollers an oval receiving and sending set is installed at head level. By this means the operative can receive or send instructions to the operative on the line below who is responsible for feeding cabinets to the assembly line. This operative, who is also supplied with similar receiving and sending equipment, signals that a certain type of cabinet has been placed on the line. The operative on the gantry above then selects the correct chassis from his store and allows it to run forward on to another roller conveyor alongside which several operators stand and perform certain preparation work on this chassis. These operations are timed to match the movement of the cabinet on the conveyor below so that, on completion, it is ready to be lifted from the conveyor and lowered by Martonair hoist into the cabinet which reaches the correct station at the same time. In the event of a particular type of chassis being unavailable, the cabinet feeder below is advised through the speaking set, and a different cabinet is fed to the line from a small float held there for the purpose. This float is fed from the supply arriving from the cabinet department.

After the assembly of chassis to cabinet, each set travels forward on the belt conveyor where other operations, such as connecting fly leads and fitting styling accessories, glass screen and back cover, are performed. The glass screens are

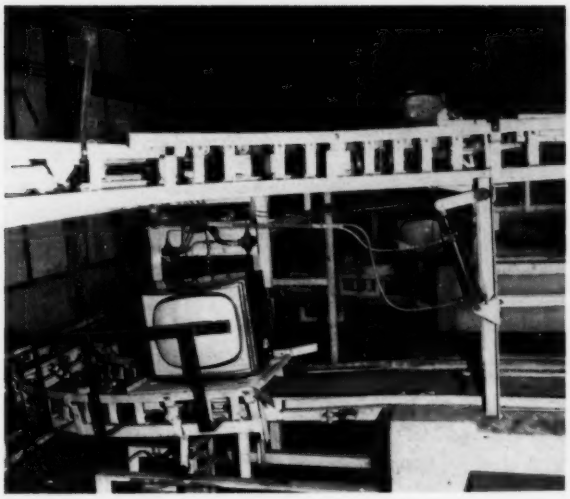


Fig. 13. Rejected and O.K. receivers entering left- and right-hand roller bends delivering to cross conveyors that take them respectively to the repair section and loading position for conveyance to the polishing and packing department

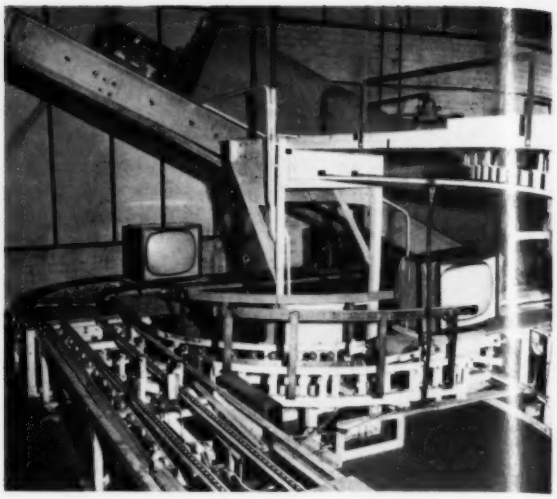


Fig. 14. Delivery end of the cross chain conveyor from which finished receivers pass round a bend on to rollers to await loading on to the inclined conveyor above that leads to the polishing and packing department

delivered to the line in special containers and are conveyed along the belt until the correct station is reached. Back covers are delivered by chute from the gantry supplying the other lines.

At various stages of assembly the work is inspected, rejected if necessary and placed on adjacent roller conveyors for rectification and re-inspection. When considered O.K. for final test, a receiver is held with several others at the end of the assembly conveyor and the beginning of a slatted belt conveyor which runs through a sound-proofed tunnel alongside seven final test cabins. At a pre-set signal the slatted belt moves forward at about 60 ft/min, and the waiting sets run on to marked sections of the conveyor which continues to move forward for 30 seconds until each set is positioned immediately in front of one of the test cabins. The belt then halts for 4½ minutes, during which time the sets are tested while still on the belt. On completion of the testing the belt moves forward again for a period of 30 seconds, thus removing the tested sets from the test stations and delivering further sets in the same positions for testing. To ensure that the valves are thoroughly warmed up for testing the sets are plugged into a moving electrical connection similar to that used for the electrical soak on the King conveyor.

Fig. 15. The repair section where rejected receivers are rectified prior to re-testing

Rejects are sent forward with O.K. sets on a V.M.E. conveyor but are turned about face for easy recognition by the diagnosis tester further along the line. They are removed from the belt for diagnosis and then sent along an adjacent roller conveyor to the common rectification section for attention, re-tested and returned to the line for re-final test. A percentage check test is performed on O.K. sets similar to that given on the other final test lines.

O.K. sets on the A line are finally delivered by roller conveyor on to the end of the chain cross conveyor taking the other sets to the loading position for delivery to the polishing and packing department. Automatically operated pneumatic equipment gives them priority of passage and prevents collisions with receivers coming from the B, C and D lines. Before the points of entry of the latter, A line receivers run on to a short section of conveyor fitted with roller wheels and hinged at the further end. The receiver pallets there actuate a trigger control of the pneumatic system so that the other end of the section is raised and the resulting incline accelerates the movement along the conveyor. Entry of the receivers from the B, C and D lines is similarly accelerated but so timed that collisions are avoided irrespective of the rate of arrival of the receivers. This applies also to the rejected receivers delivered on to the upper cross conveyor leading to the repair section.

Fig. 1. Selector screen plant for classifying stone from secondary crusher into minus ¾, ¾, 1½ and 2 in. The conveyor feeds stone to the final screens

NEW PLANT FOR SCREENING, STORAGE AND AUTOMATIC GRADING

1,400 tons of stone a day handled by Cliffe Hill Granite Company, Limited

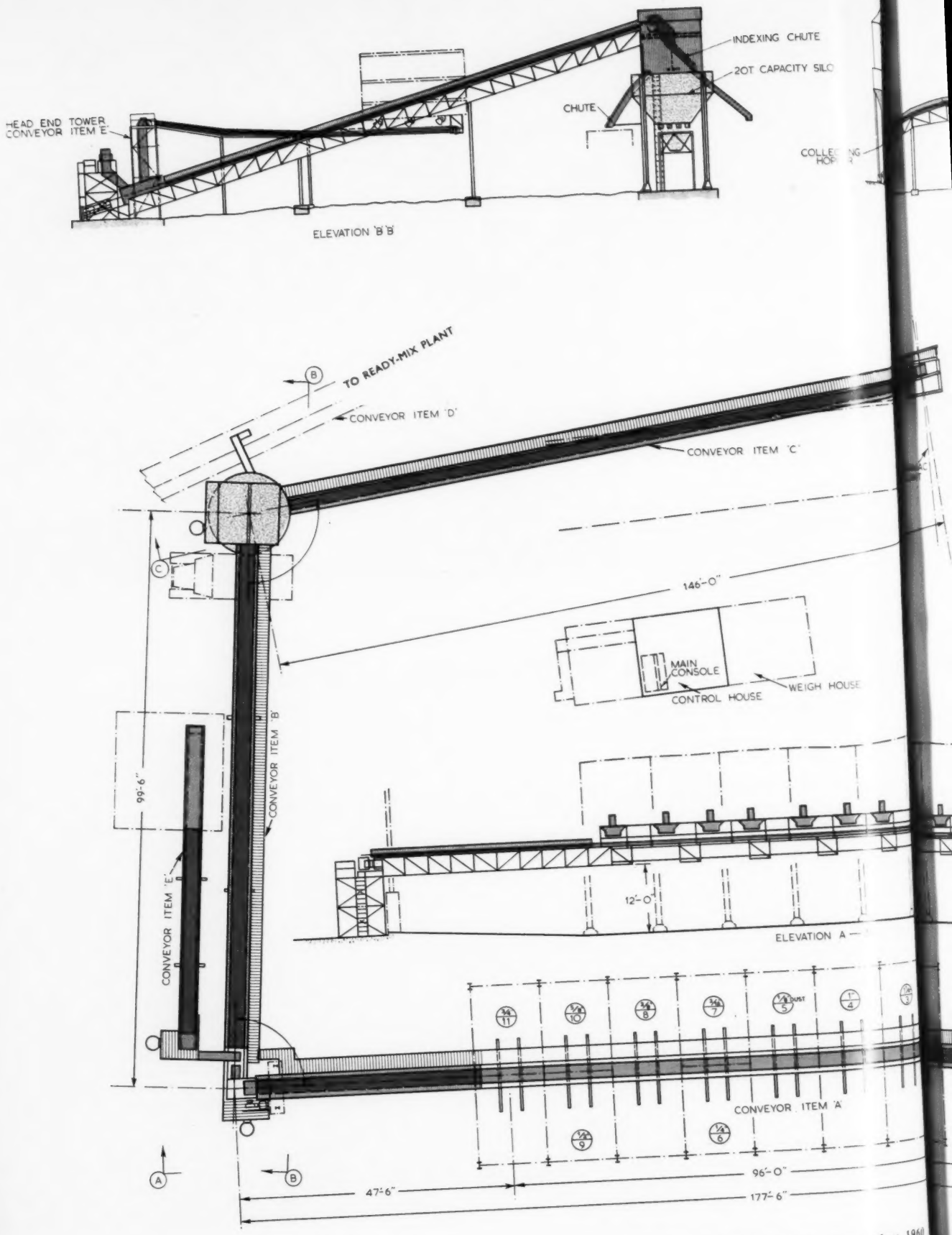
Used as building materials for centuries, the igneous rocks of Leicestershire have won a high reputation for durability and strength. The Cliffe Hill Granite Co., Ltd., have been producing stone from this source since 1894 and to-day supplies many different sizes of rock in various forms to markets within a radius of 140 miles or so. About 1,400 tons of stone are quarried daily and processed in the adjoining plant into such products as coated stone, ready-mixed concrete, road chippings, aggregates, railway ballast, filter media, etc. Several grades of fine-washed stone are supplied for high-class granolithic work.

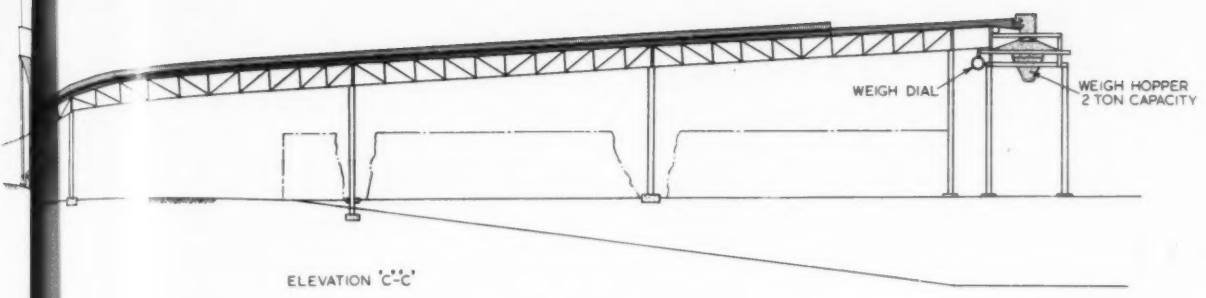
Situated at Markfield, between Leicester and Ashby-de-la-Zouch, and on the borders of Charnwood forest the quarry lies in Pre-Cambrian rocks, consisting of extrusive and intrusive igneous types with sediments formed from volcanic ash. The main stone worked at Cliffe Hill is a type of syenite known as Markfieldite, a rock of mottled grey-green and pink colour with distinctive crystalline structure. It has a specific gravity of 2·8 and weighs about 4,700 lb/cu. yd. Average crushing strength is 34,600 lb/sq. in. abrasion value 19·3, impact value 6·53, crushing value 13·65, absorption of water 0·15, and attrition (dry) 1·49.

Stone is produced from three faces, one on each of three levels. The top face varies from 20 to 85 ft in depth, the lower ones being 55 ft each. Halco-Stenuick Mk II drill rigs are used for drilling most of the primary blast holes, these machines, fitted with latest down-the-hole hammer, achieving a drilling rate of 8/9 ft per hour.

About 30 ft of hole is drilled between bit-sharpening and a total life of approximately 400 ft per bit is recorded. For each blast four vertical 4-in holes are drilled in two parts, each hole of a pair being 6 ft apart and each pair 10 ft apart. Holes are drilled up to three or four blasts ahead and, immediately prior to charging, are blown out by compressed air.

Two 37 RB and one 38 RB Ruston Bucyrus face shovels are able to handle the loading out of the broken rock, one of these normally being used as a stand-by. The hard rock


HEAD END TOWER CONVEYOR ITEM 'E'
INDEXING CHUTE
20T CAPACITY SILO
CHUTE
ELEVATION 'B' 'B'
TO READY-MIX PLANT
CONVEYOR ITEM 'D'
CONVEYOR ITEM 'C'
146'-0"
MAIN CONSOLE
CONTROL HOUSE
WEIGH HOUSE
99'-6"
CONVEYOR ITEM 'B'
CONVEYOR ITEM 'E'
12'-0"
ELEVATION A
CONVEYOR ITEM 'A'
47'-6"
96'-0"
177'-6"



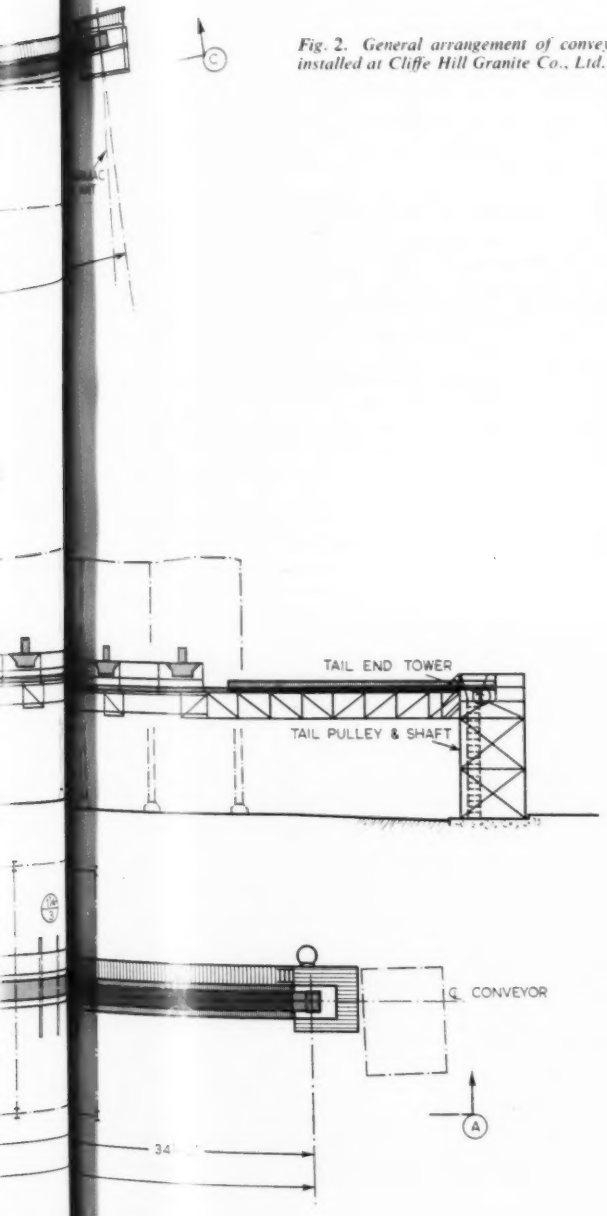


Fig. 2. General arrangement of conveyors installed at Cliffe Hill Granite Co., Ltd.

causes considerable wear to the bucket teeth which usually need rebuilding by welding every 10,000 tons or three weeks' operation. Five dumpers are used to carry stone to the primary crusher and a further two are available for stock piling or as stand-bys. A *Traxcavator* with 2¼-yd bucket is also employed generally on stockpiling and clearing.

Primary Crusher

This is a 30-in Allis Chalmers gyratory type situated on the second level of the quarry, approximatey 300 yards from the furthest sources of stone on this and the top level. The road from the top level falls with a gradient of 1 in 10 and from the lowest level rises 1 in 8. An average of 1,400 tons of stone is fed to this crusher every day, each of the five dumpers making about 30 trips. The dumpers tip directly into the feed opening instead of operating through a feeder and thus saving considerably on maintenance and power costs, since the manganese concaves last 12 months and the head mantle 24 months.

After reduction to −6 in by the primary crusher the stone is carried by a 500-ft conveyor rising 150 ft to the plant and discharging into a 100-ton hopper. After removal of −1¼ in stone and dirt by a live four-roll grizzly the clean stone is discharged into a 300-ton hopper from which it passes for further processing by the Nordberg 4¼-ft secondary crusher. The undersize from this grizzly is processed into three small grades which are used for granolithic flooring material after having been washed, ready-mixed concrete aggregates, and for secondary crushing.

To obtain the necessary degree of flexibility of production a selector screen installation has been included immediately after the secondary crusher. This classifies the stone into −⅜ in, −¾ in, −1¼ in, and oversize which is recirculated through the crusher. This selection of sizes enables the appropriate size of stone to be fed to the tertiary crushers without having to use extensive conveyor runs and without having to pass the entire production through the final screens.

The selector screen is a Symons horizontal vibrating screen, 5 ft wide and 14 ft long, discharging its four fractional products into separate bins each of 100 tons capacity, from where they can be conveyed to the tertiary crushers or direct to the final screens. Tertiary crushers are a Nordberg 3-ft producing −⅛ in, and Nordberg 4-ft producing −¼ in, size.

By this arrangement of selector screen and tertiary crushers an extra heavy demand for a certain size can be met by directing sufficient stone of suitable size to the appropriate crusher thus obviating unnecessarily large stockpiles of sizes for which there is only infrequent demand.

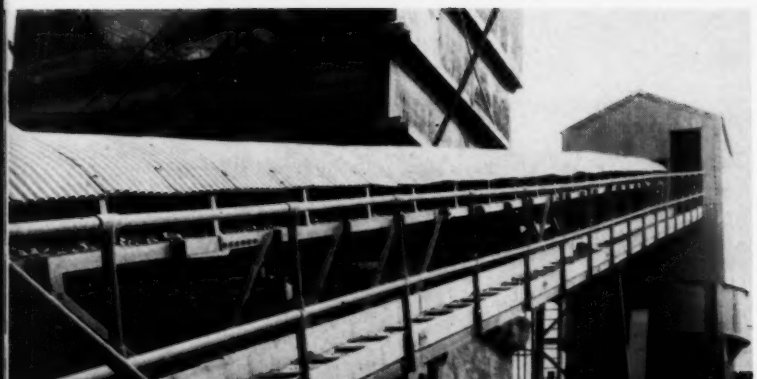


Fig. 3. Conveyor 'B' leading from end of conveyor 'A' into 8-compartment silo

Fig. 4. Conveyor from selector screens to the main screens and storage bins

Fig. 5. Conveyor 'C' from the 8-compartment silo to the Tarmacadam plant

Final Screens and Storage Bins

The final screens are situated on the top of the storage bin building and material arriving here first passes a scalping screen which separates the feed into $+\frac{3}{4}$ in and $-\frac{3}{4}$ in. The $+\frac{3}{4}$ in material then passes a single deck vibrating screen, fitted with three meshes, which separate the stone into 1 in, $1\frac{1}{4}$ in, $1\frac{1}{2}$ in, and 2 in, each size being discharged by gravity into its respective storage bin below. The $-\frac{3}{4}$-in material passes first over a double-deck screen which takes out the dust, and $\frac{1}{4}$-in stone, and then over a single deck which takes out $\frac{3}{8}$ in, and $\frac{1}{2}$ in. These four sizes and the $-\frac{3}{4}$-in stone are also discharged into storage bins below.

The entire storage plant which is 108 ft long by 30 ft wide by 40 ft high houses 11 bins, seven of 300 tons and four of 150 tons capacity. The bins are fitted with pneumatically operated discharge gates to enable lorries to be loaded direct with appropriate grades of stone.

The structure housing the selector screen and its dust-collecting cyclones and the conveyor to the final screens and storage bins were installed by Thos. W. Ward, Ltd., as were the final screens and main storage bins described above. This part of the reconstruction scheme, known as phase 1, was completed in September 1958.

Phase Two

Phase two of the reconstruction scheme, involving the installation of a fully automatic grading system, was commenced in June 1959, and is intended to give a greater degree of flexibility, so that the plant is capable of being put into operation quickly for any of the following duties:—

(*a*) Delivering batches of material to the existing Tarmacadam plant which has a capacity of 30 to 40 2-ton batches every hour.
(*b*) Delivering batched material into lorries.
(*c*) Delivering batched or graded material to a ready-mixed concrete plant.
(*d*) Delivering graded materials into stock.

A general layout of the plant is shown in Fig. 2, which gives the arrangement of bins, conveyors, silos and mixing plants. To enable conveyor (A) to be installed it was necessary to cut away the bottom of each storage bin and install the constant rate feeders mentioned below. This work and the installation of conveyors (A), (B), (C), (E) and the 8-compartment silo were carried out by the Ensign Conveyor Co., Ltd., the Materials Handling division of

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Thos. W. Ward, Ltd. The control console and electrical system was supplied by Ericsson Telephones of Nottingham as sub-contractors.

Graded materials are delivered to the storage bins from the crushing and screening plant, and each bin is fitted with an 'Accra batch' constant-rate feeder which feeds on to conveyor A. These feeders are set to deliver 120 tons/hr each, and feed is controlled by the central control system, on a time basis.

The main console has 'plug-in' programme units so that 11 materials contained in hoppers, with 11 constant-rate feed systems, can be metered out by the timing system which controls the contactors of the feed motors. These timers are settable to an accuracy of 1 second, with a maximum time of 99 seconds. Up to 11 times can be set up simultaneously by this programme unit, which is a plug-in 'batch' panel. During the grading of a batch of material, feeds of all required grades commence simultaneously, so that mixing of the materials takes place on the conveyor run.

The forward end of conveyor (A) discharges on to conveyor (B) which in turn discharges into the 12-position indexing chute on top of the 8-compartment silo. A flow-indicator switch has been provided at the head end of this conveyor to give visual indication of material flow over the indexing chute to the plant controller. Eight of the 10 indexing chute positions correspond to the 8 silo compartments and each of these compartments holds a 2-ton batch of graded material. The actual selection of indexing chute position over the 8-compartment silo is automatically controlled by the operation of the control system. The indexing chute steps over the first empty storage bin, irrespective of its position in the silo and the 9th and 10th positions (the 11th and 12th positions are held as spares). Readymix conveyor and lorry-loading position, respectively, are selected by a switch on the main console.

In the 9th position the chute feeds to the readymix conveyor via a by-pass chute. In this position the 'Readymix' conveyor will be started if conveyor (B) is operating. Indicator lamps show that the 'Readymix' conveyor is running, also whether the swivel chute is in the 9th position.

The 10th position feeds direct to lorry via a by-pass chute. A lamp on the control console, connected to a push switch at the loading site, enables this lorry driver to indicate he is in position and ready for a load.

All conveyor, silo direction, storage, and delivery movements are controlled from the central control panel, and all power feeds to the conveying and feeder systems are fed directly from this panel, which carries all contactors, fuses and isolator.

Batch formulae fall into several categories:—

(*a*) *Commonly-used formulae.*—Formulae numbers have been allocated to each type of mix, and sufficient plug-in programmes are supplied to produce 30 different formulae, each carrying its own code number. A limitation of 48 formulae exists in the equipment.

(*b*) *Non-standard mixes.* Manual switches are provided which permit setting up of up to 2 tons of any or all of the 11 grades used. Formulae made up in this way are allocated formula No. 99. This number has no significance other than to indicate that a specially made-up batch has been delivered. In order to facilitate checking of the total quantity called up in such a manual operation, a totalizer system is fitted which indicates the total weight of the batch.

(*c*) *Single-grade deliveries.*—A formula plug is provided which will permit delivery of a batch of 2 tons of any selected one of the 11 grades. The formula No. 99 is again allocated to this batch. In all cases, the formula plug contains instructions to the system covering:—

(*a*) formula number; (*b*) time of entry of this formula number into a corresponding indicating store; (*c*) time of completion of the batching operation, so that subsequent batches can be delivered.

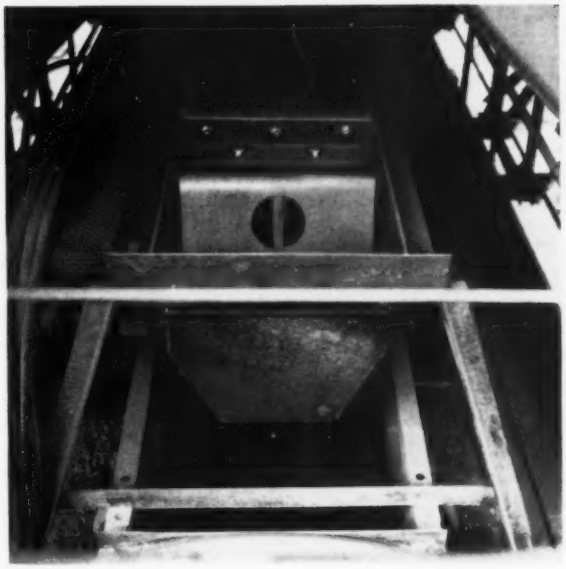
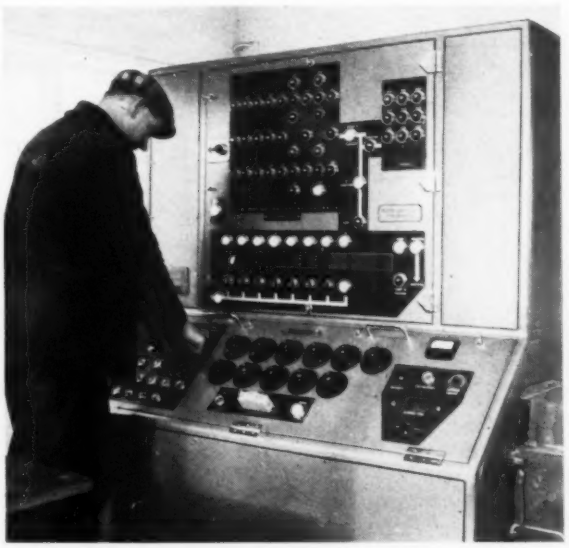


Fig. 6. 'Accra batch' constant rate feeder, feeding materials from one of main storage bins to conveyor 'A'

At the main control panel the formula number corresponding to a batch is displayed on Digitron number-indicating tubes in a position corresponding to the silo into which the batch has been delivered. Indication of the silo selected by the swivel chute is also given by a lamp on the control panel. This information is duplicated at a 'slave' panel operated by the attendant at the tarmacadam mixing plant. At the main panel, indication is given by a lamp of the silo compartment which the Tarmacadam plant operator

Fig. 7. Central control panel, installed by Ericsson Telephones, Ltd., Nottingham as sub-contractors



intends to empty, and when the silo is again emptied the formula number display for this compartment will be cancelled.

Repeat batches. A batch counter unit is fitted which will permit delivery of up to 10 batches of any desired formula. Normally only one batch will be delivered, unless the 'batch repeat' operation is called up by pressing a 'Set Batches' push-button. Provision is made to give the operator an indication of the total weight of materials set up during a manual/repeat batch operation. In such a case, the operator sets-up a 'desired weight' and adjusts the number of batches until the indication is given that this weight will be delivered. Thereafter the control system will operate until the total weight has been delivered.

Feed indication lights are provided for each of the 11 storage bins. Lights are also provided which are used as indicators of high and low bin level in conjunction with level indicating systems.

Feed of any of these 11 materials will be inhibited if conveyor (A) is switched off, or if any bin is registering 'low'. If the 'low' level signal occurs during delivery of a batch, the timing system will be stopped after completion of the 2-ton batch in progress.

No material may be delivered until: (*a*) the relevant conveyors are in operation; (*b*) either an empty storage bin exists or the swivel chute is directed to the 'Lorry' or 'Divertor' positions; (*c*) a formula plug is in position.

Provision is, however, made for a future stocking system which will be supplied by an extension to conveyor (A) working in the reverse direction; 11 manual feed switches are fitted which can be used to deliver 11 manually controlled feeds from the 11 bins via the Accra batch feeders, providing that Conveyor (A) is operating in the reverse direction only. Interlocks on 'low' level are not applicable in this context.

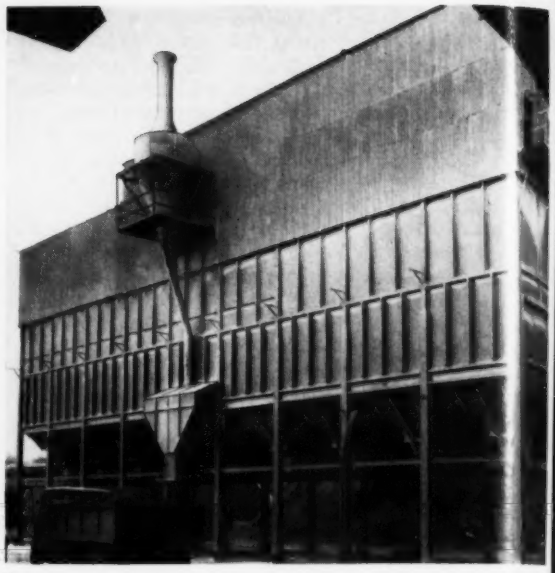


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Fig. 8. Central aggregate storage plant and screens, 108 ft long by 30 ft wide by 40 ft high, containing seven bins holding 300 tons each and 4 bins of 150 tons each

Fig. 9. Beneath the main storage plant, showing pneumatically operated chutes for delivering direct into lorries and also the conveyor 'A'

9

Slave panel in Tarmacadam plant.– Conveyor (C) and the 8-silo delivery gates can be controlled by an operator sited remotely from the main panel, a slave panel being provided with the following facilities. The panel has eight similar channels, each channel referring to a correspondingly numbered silo bin, and having indicating means for display of contents of each bin, by formula number if full and by no indication if empty. A 'Feed control' selector is also supplied which operates the selected radial gate control. If Conveyor (C) is not operating, gate opening will be inhibited.

Also, to enable the plant to be used for 'wet mix' and 'lean mix' batching, a feeder conveyor (E) from an existing 3-compartment hopper feeds on to the tail end of conveyor (B). The feed on to conveyor (E) is by three radial gates timed to give a certain quantity combination from any of the three materials and is selected from the main console manually. Both the opening of the gates and the running of conveyor (E) is inhibited if conveyor (B) is not operating.

Thirty programme units are provided and are wired to specification, i.e. formula for mixers, B.1-15 and T.1-15. Further programmes up to 48 different formulae can be supplied. A mimic panel display is fitted to the master control panel showing the operation of the system.

Fig. 1. The despatch bay, showing four openings, giving direct access to the packing department

One Reach Truck Serves Large New Depot

By C. E. Parnall

THE history of Oxo, Ltd., dates back to 1865 when the Liebig, Extract of Meat Co., Ltd., was first founded in London. This company took over the activities of Giebert & Co., who pioneered and commenced the manufacture in 1863 of meat extracts at the small town of Fray Bentos in Uruguay. The present company Oxo, Ltd., was incorporated in 1914.

Expansion and development within the Liebig Group has been considerable over the years. Over 200 different lines are now produced in the U.K. by Oxo, Ltd., who have established a number of depots strategically placed so that by their own delivery van fleet they can offer direct service to the majority of their customers whether they be the biggest or the smallest grocery outlets.

In order to improve this service still further a policy of rebuilding or adapting existing depots to meet the requirements of mechanical handling has been put into operation. The Bristol depot, which serves a large area of the west and south-west of England and which forms the subject of this article, is one of the most recent examples.

Here it was found necessary to build an entirely new building situated on the opposite side of the city to that of the old depot. This entailed a transfer of staff, stock and a certain amount of equipment, all of which by careful planning was undertaken without interference to service to the customer.

As can be seen from the layout, the new building covers an area measuring approximately 138 ft deep × 98 ft wide, the largest area being occupied by the warehouse, which is approximately 73 ft wide × 78 ft long. A wall divides the warehouse from the adjoining packing area, two horizontal sliding doors being provided for access between the two departments.

Fig. 2. Off-loading from one of the fleet of A.E.C. Mammoth-Majors

On the opposite side of the packing department to the warehouse there is another wall dividing off a large despatch bay. Four sliding steel shutters are provided in this wall to give direct access between the packing department and outgoing delivery vans.

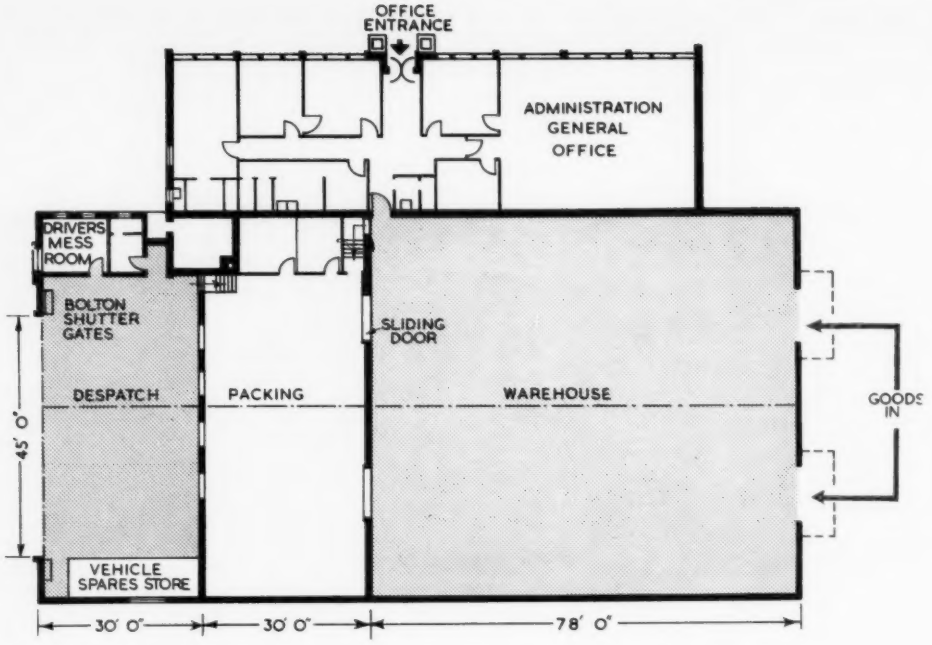


Fig. 3. Layout of the new Bristol depot of Oxo, Ltd.

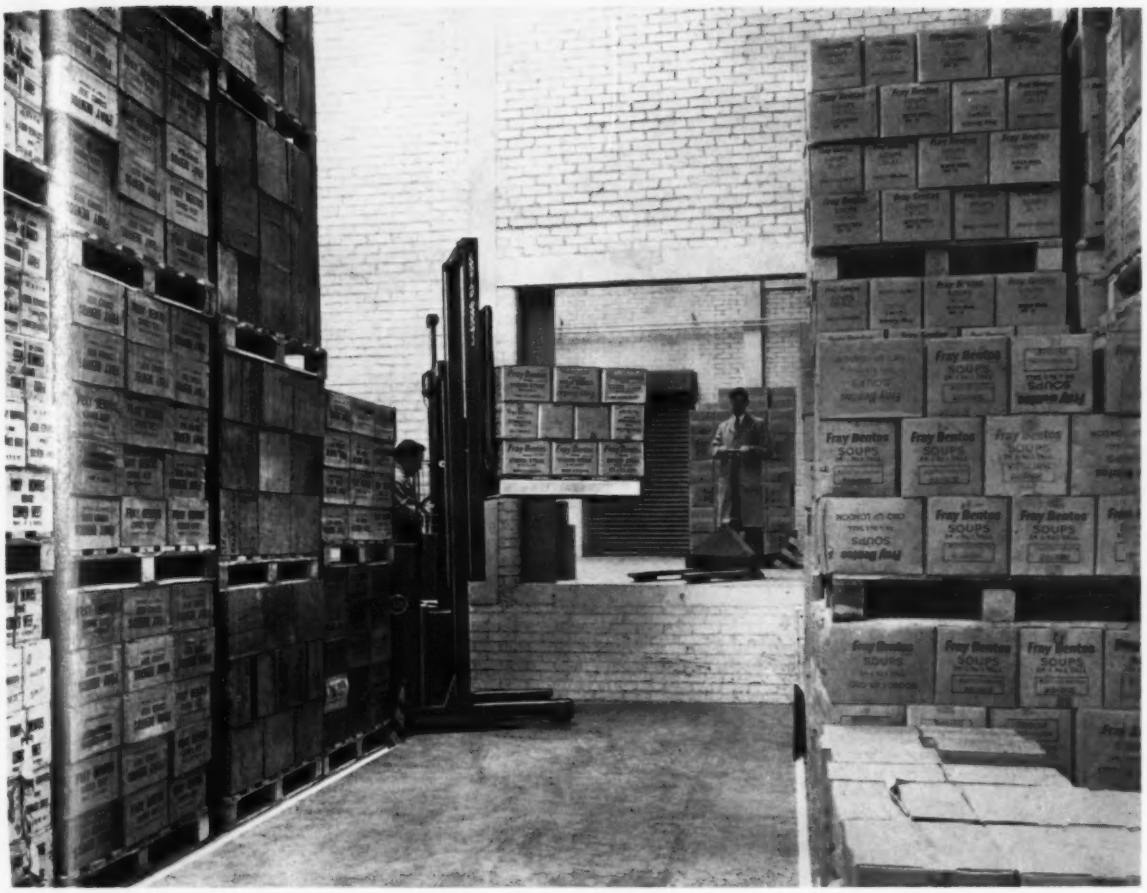
The floor level of the packing department is raised just over 3ft above the floor levels of both the warehouse and the despatch bay, so as to coincide as near as possible with the floor levels of the delivery vans. This enables loaded pallets to be lifted and transported by a reach truck and loaded through one of the sliding doors and placed direct on to a hand-propelled pallet truck. The loaded pallet truck can then, if required, be wheeled straight into a van backed up to one of the openings to the despatch bay. Alternatively, loaded pallets are taken to one of several packing benches from where small packets and cartons are wheeled into the vans by hand trucks.

Fig. 4. An incoming load being transferred to the warehouse

Along the north side of the building is situated a large general administrative office, together with offices for executives, a staff canteen and kitchen. A drivers' mess-room and a store for vehicle spares is provided in the despatch bay area, the whole of which can be closed off from the outside concrete paving by a Bolton electrically-operated shutter gate 45 ft wide. A battery charging unit for the reach truck is located in a corner of the warehouse.

Apart from an essential link in Oxo, Ltd.'s, comprehensive distribution network, this Bristol depot may be taken as an excellent example of efficient and extensive utilization of a single reach truck. Only one battery-operated Lansing Bagnall truck is used, which is in almost continuous operation throughout working hours. To ensure maximum efficiency, all drivers of the truck are given a course of instruction on the operation and maintenance of the vehicle.

Incoming consignments are delivered by the company's own fleet of vehicles, which consists chiefly of A.E.C. *Mammoth-Majors*, a type which it is intended to standardize throughout the fleet. These vehicles draw up on a concrete paved area at the rear of the premises and adjoining the warehouse. Reversible wooden pallets loaded to an



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average of 2,200 to 2,400 lb each are off-loaded from the vehicle by the reach truck, and transported direct into the warehouse where they are stacked up to three high. By the use of this truck it is possible to off-load a 12-ton vehicle in about 20 minutes which compares with up to two hours required for unloading manually. Paliton pallet trucks made by Omic, Ltd., are used for handling separate loads within the warehouse and packing department areas.

Fig. 5. Transferring a loaded pallet from warehouse to packing department

Fig. 6. Hand trucks are used for wheeling small loads direct into delivery vans

Fig. 7. A delivery van in its loading position

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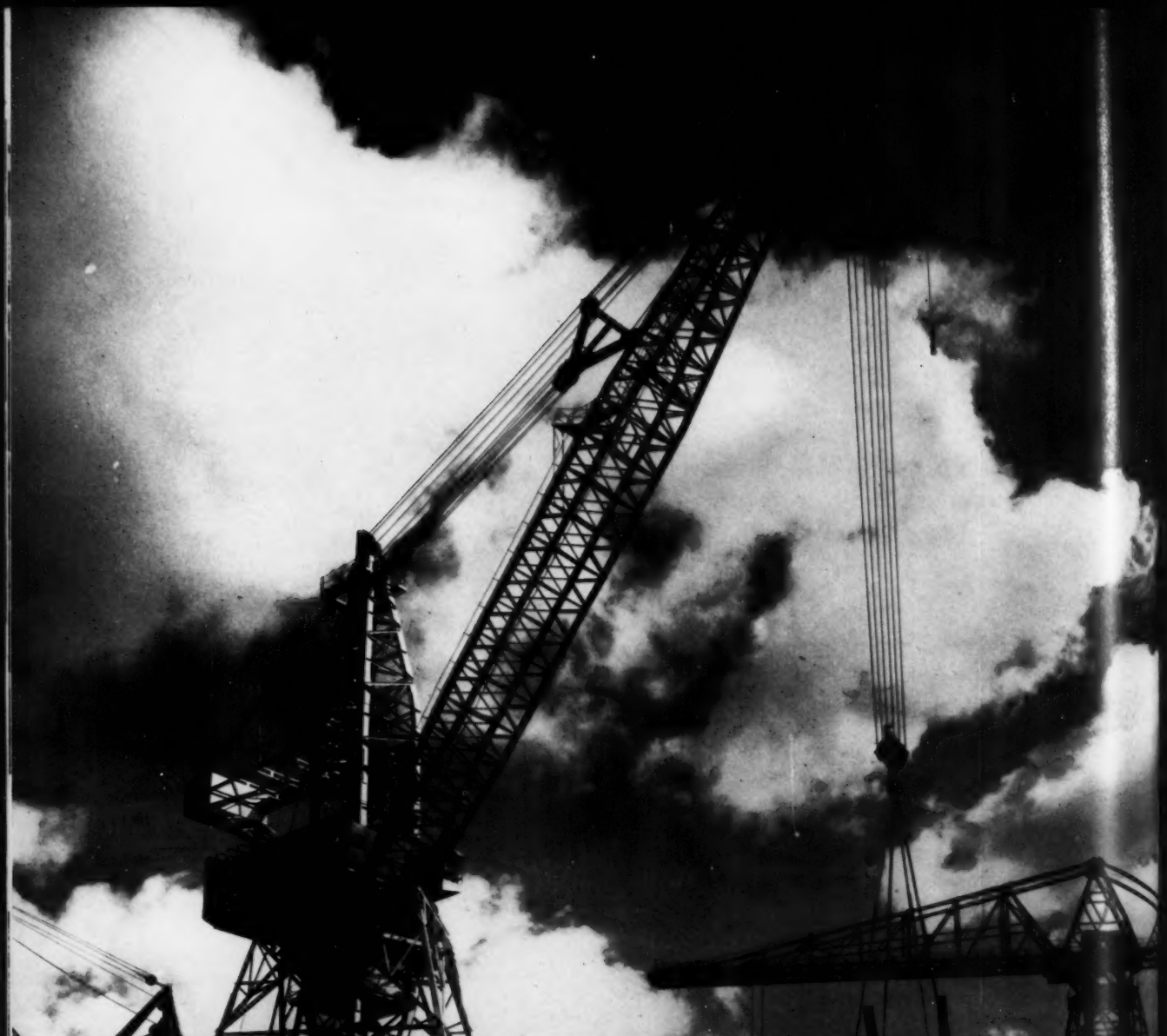


Crane Builder and Shipbuilder Combine to Achieve Prefabrication on a Grand Scale

By a Special Contributor

In shipbuilding, as in the construction of factories and bridges, prefabrication has changed the whole aspect of the undertaking. The replacement of a large number of small constructional units assembled on site by a relatively small number of large units prefabricated in workshops has introduced new concepts of speed and productivity, for a great part of the work has been brought under cover where it can be carried on under optimum conditions of lighting, isolated from climatic vagaries, and organized in accordance with the chosen systems of plant layout, production planning, and quality control.

It has been acknowledged that the prefabrication techniques now practised in the shipbuilding industry have been made possible by the enormous progress that has been made in welding technology. The full exploitation of these techniques would not have been possible, however, had there not been a corresponding progress in the development of equipment with which to handle the large prefabricated units.

Illustrative of this interdependence, and of the great strides that can be made when shipbuilders and crane builders work together, is the provision made by Cammell Laird & Co. (Shipbuilders & Engineers), Ltd., when drawing up the reconstruction plans for their Merseyside shipyard, for the installation of monotower travelling cranes to transfer sections weighing up to 100 tons from welding bays to slipways.

The reconstruction plan, which is now in progress, has as its main purpose the provision of facilities for the more speedy building of a greater diversity of ships, and for their dry-docking and repair. Among the vessels provided for in the extended range are the super-tankers of up to 100,000 tons capacity, one of which was seen under construction during a recent visit.

It is an immense project, programmed in three phases, the first of which includes the construction of a dry dock 950 ft long, with an entrance 140 ft wide, and a tanker-cleaning berth at Rock Ferry, with its associated shore installation, and the reconstruction of a jetty with extended slipways adjacent to the new shipbuilding shops in the South Yard at Birkenhead.

100-ton Cranes on the New Jetty

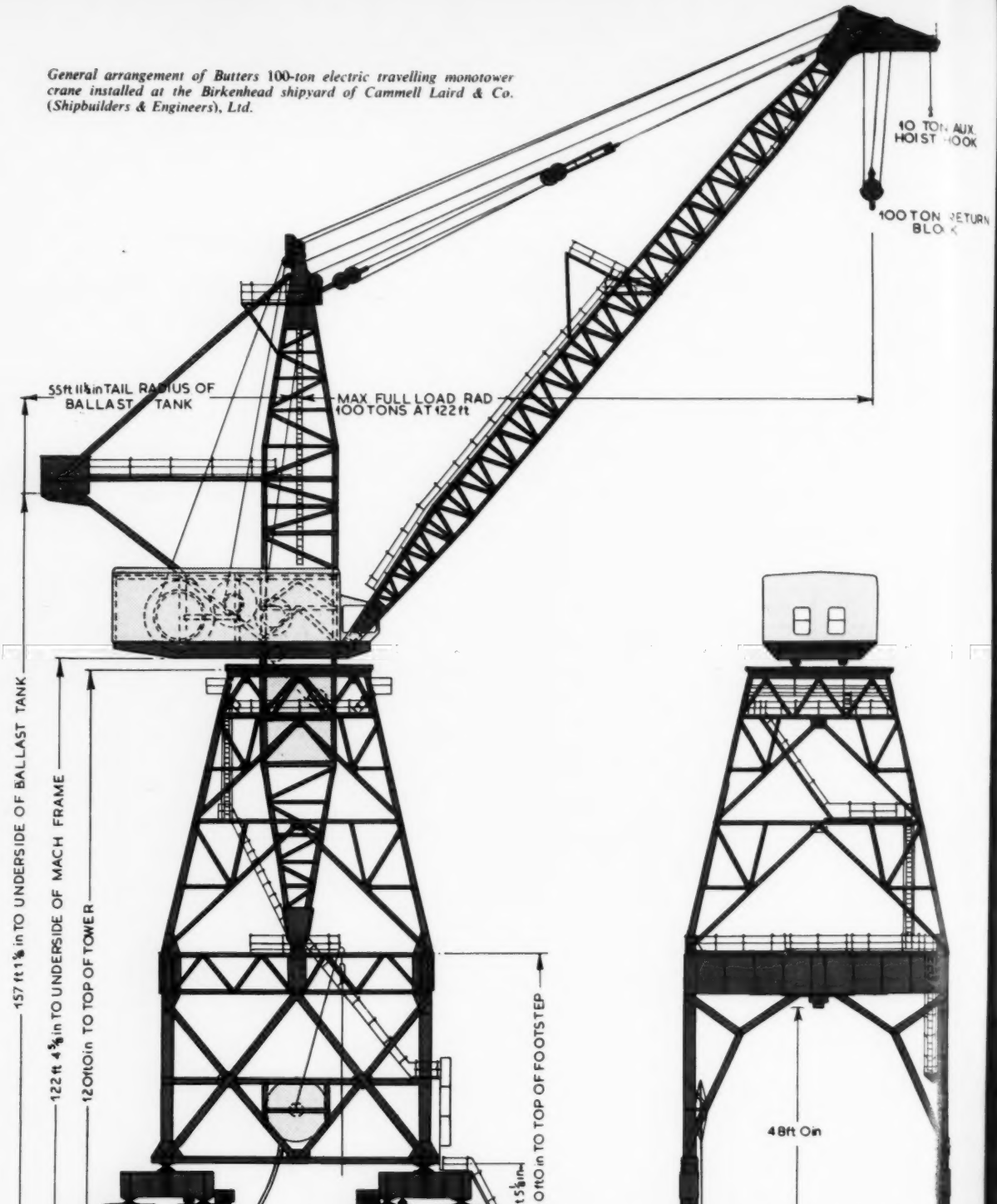
Prefabricated sections of up to 100 tons in weight can be produced in the new shipbuilding shops in the South Yard. They are incorporated in vessels built on the slipways of the new jetty, which are being extended to lengths of 900 ft and 850 ft to provide the two largest building berths in the Birkenhead shipyard. Super-tankers and other large vessels will be built on these slipways, which are on reinforced concrete rafts, supported by Bonoto piles at sections where the loading is heavy.

Two rail-mounted portal cranes, of 100 tons lifting capacity at 122 ft radius, will travel along the jetty between the two slipways and place the large welded sections, as construction proceeds, on vessels on either slipway. Each crane, weighing approximately 850 tons, runs on a 55-ft wide track. Under each track, post-tensioned prestressed concrete beams are supported by two rows of Bonoto piles. These piles are 3·28 ft dia, and are made by boring down to the rock that

From a cabin 126 ft above rail level, the driver has an uninterrupted view of the load. Behind him is the 55-ft long machinery house

←*This Butters monotower travelling crane, believed to be the largest in the world, has been installed at the Cammell Laird shipyard in Birkenhead to enable sections weighing up to 100 tons to be prefabricated under cover and transferred from welding bays to slipways*

General arrangement of Butters 100-ton electric travelling monotower crane installed at the Birkenhead shipyard of Cammell Laird & Co. (Shipbuilders & Engineers), Ltd.


10 TON AUX. HOIST HOOK
100 TON RETURN BLOCK
55ft 11¾in TAIL RADIUS OF BALLAST TANK
MAX FULL LOAD RAD 100 TONS AT 122ft
157 ft 1⅛ in TO UNDERSIDE OF BALLAST TANK
122 ft 4⅜ in TO UNDERSIDE OF MACH FRAME
120ft 0in TO TOP OF TOWER
15 ft 5⅜in
6 ft 10in TO TOP OF FOOTSTEP
RAIL LEVEL
86 ft 4in
48ft 0in
55 ft 0in crs.

usually lies approximately 75 ft below the deck of the jetty and filling the hole with concrete.

Between the crane tracks, the jetty deck at the shore end is formed by laying a concrete surfacing on filled material contained between retaining walls. At the river end, where the slipways on either side are considerably below the level of the jetty, the deck is composed of precast concrete slabs which are carried on precast concrete beams supported by Bonoto piles.

Electric current supplied by a 6,600-V ring main cable is transformed to 433 V and distributed from a sub-station under the jetty to provide energy for the motors of the electric cranes.

One of the two giant travelling monotower cranes has recently been installed and is now being used to handle prefabricated sections for the construction of a super-tanker on one of the extended slipways. It is one of the 15-, 50-, and 100-ton cranes of similar type that have been designed,

constructed, and erected by Butters Bros. & Co., Ltd., Glasgow, for the work of transferring such units from the welding bays to the slipways. Capable of lifting its maximum rated load of 100 tons at 122 ft radius while standing free on rail, it is claimed to be the largest crane of its type that has ever been built in any part of the world.

Supported on 32 centre-flanged rail-wheels, the travelling tower stands 120 ft high. Its base is designed to provide a portal opening 48 ft high and 49 ft wide giving free access to the building berths. The top of the revolving mast is 214 ft above rail level, while the height to the point of the jib when at minimum radius is 300 ft.

From a heated cabin 126 ft above rail level and glazed on three sides, the driver controls all the motions of the crane and has an uninterrupted view of his load. He is in telephonic communication with the ground and his controls are grouped within easy reach.

Safety and Machine Protection

Personnel and machinery are safeguarded by a number of protective devices. On the hoist and luff motions there are spring-loaded air-released disc brakes that are always in the holding position unless released by the operator. These are additional to the electrically operated brakes controlling all the motions, which come into operation automatically when the electric power is switched off and the crane is left unattended or when the circuit is broken by limit-switches on the hoist and luff motions. The switches prevent overluffing in both directions and overhoisting at any radius. Visual and aural warning of overloading is given by a safe-load indicator, and an alarm bell sounds when the crane is in motion—a precaution that is made necessary by the quiet running of the travel gear.

Shocks are absorbed by slipping clutches on the slew gear and flexible couplings on the travel transmission. Overrunning on the slew is prevented by torque-transmitting springs and braking shocks on the travel by a time-lag on the electromagnetic brakes. Care has been taken to counteract the effects of distortion and deflection in dynamically stressed parts of the structure by providing means of adjustment and compensation and arranging for adequate distribution of the loads.

The prefabricated deck-section is about to be lowered into position on the tanker. This unit weighs only a fraction of the load that can be handled at the full 122 ft radius of the crane

Free access to building berths—and, on this occasion, a parking place for double-deck buses—is afforded by the portal opening 48 ft high by 49 ft wide at the base of the tower

Substantial gains in efficiency have been achieved by the gearing and reefing arrangements, which have the effect of reducing the force required for luffing. The levelling barrel to which the return part of the hoist rope is anchored gears with the luffing barrel in such a way that when the luffing rope is paid out the hoist rope is coiled in at the speed required to transmit the load horizontally, with the result that the torque applied to the levelling barrel by the return part of the hoist rope tends to rotate the luffing barrel in the direction required for luffing in the jib.

This levelling effect is assisted by the reefing arrangements, which have the effect of further reducing the load or the luffing gear, and hence the horsepower required of the luffing motor and the size of the bridle and luffing ropes.

Specification

The 100-ton Butters electric travelling montower crane is fitted with a 175-ft jib and a 10-ton auxiliary hoist. In complete working order its weight, including ballast, is approximately 890 tons. Performance ratings and wheel-loadings are given in Tables I and II.

Table 1
Operational Data for Butters 100-ton Travelling Monotower Crane

	Load tons	Radius ft	Speed ft/min
Maximum lifting capacities:*	100	122	
main hoist (6 falls)	75	132	
	60	145	
	40	160	
auxiliary hoist	10	170	
	100	52†	
Speeds: hoist, slow gear	100		10
fast gear	40		25
auxiliary hoist	10		90
luff	100		28-30
slew	100		180
travel	100		40

*These are safe-load ratings with 175-ft jib fitted with an extension piece at the point and the crane standing free on rail at 55-ft rail-centres.

†Minimum radius for auxiliary hoist.

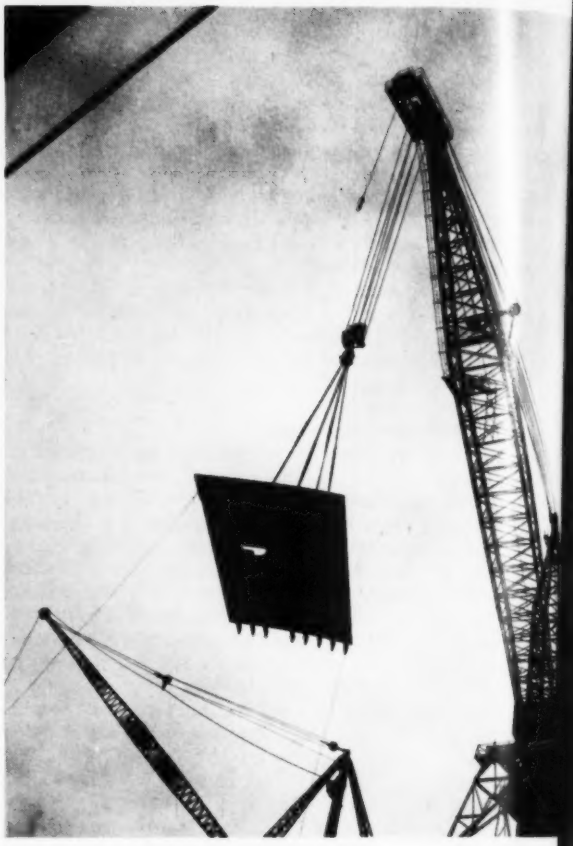
Table 2
Wheel Loadings for Butters 100-ton Travelling Monotower Crane

Operating conditions	Load, tons
Working conditions:	
lifting 100 tons at 122 ft radius, wind pressure 5-7½ p.s.i.	45·5
with maximum load at one corner (load on eight wheels)	36·4
Gale conditions:	
no load, wind pressure 30 p.s.i.	45·625
maximum load at one corner (load on eight wheels)	36·5

Structure. The portal base of the travelling tower is supported at each corner on eight centre-flanged rail-wheels. It carries a 214-ft high revolving mast, with the luffing jib, driver's cabin, and machinery house forming the base of the revolving superstructure at a height of 122 ft to the underside of the frame. With the exception of the jib, the main construction is of rolled steel sections and plates formed into welded prefabricated sections riveted together on site.

The jib is of aluminium-alloy sections and plates assembled with pneumatically driven rivets. The main-hoist block is suspended from the jib point, and a cantilevered extension at 13-ft centres carries the auxiliary hoist-block. The main-hoist, luff, level, and slew motions are in the machinery house, which is 55 ft long by 24 ft 6 in wide by 15 ft high and constructed from sheet steel.

Main-hoist Motion. Loads of up to 100 tons can be lifted at a speed of 10 ft/min on a triple pulley block and a change-speed clutch enables lighter loads of up to 40 tons to be raised at a speed of 25 ft/min. The rope is of 1⅞ in dia and is carried round a grooved barrel of 10 ft dia and 11 ft 8 in length. With the exception of the barrel wheel and pinion, the spur gearing for the hoist motion is enclosed in a cast-iron gearbox and runs in an oilbath, the shafts being carried



The reefing arrangements, in conjunction with the design of the levelling gear, give a level path during luffing and reduce the power required from the motor for handling a given load

in ball and roller bearings. The hook is of the Flemish-eye type. It is mounted on a tapered-roller bearing and suspended from a triple pulley block, thus lifting the load on six falls of the rope.

An electromechanical brake capable of controlling the loaded motion is fitted to the extension shaft of the 115-h.p. hoist-motor, and a spring-loaded air-released disc brake is incorporated in the motion on the barrel-pinion shaft. The disc brake is held in the gripping position until released by an airflow regulator valve in the driver's cabin. Electrical counter-current lowering is an additional provision.

Auxiliary Hoist Motion. This motion is located within the mast frame. It is driven by its own 95-b.h.p. motor and will lift loads of up to 10 tons at speeds of up to 90 ft/min, the drive being transmitted through totally enclosed spur gearing in a cast-iron casing, with all shafting running in anti-friction bearings. The rope is 1⅜ in dia and the grooved barrel 3 ft 9 in dia by 5 ft 6 in long. The Flemish-eye hook is suspended from a ball-bearing swivel housing. The load can be held by an electromechanical brake on the motor extension shaft and counter-current lowering is incorporated.

Luffing Motion. The jib-luffing motion is driven by a 95-b.h.p. motor through totally enclosed, oilbath-lubricated worm and spur gearing. Electromechanical and air-released

disc braking are provided. The rope is of 1¾ in dia and the grooved barrel 4 ft 9 in dia by 12 ft long. The return end of the rope is anchored to a levelling barrel driven by spur gearing engaging with the luffing barrel.

Slewing Motion. Superstructure, jib, and the full 100-ton load, can be slewed at the maximum radius of 122 ft at a speed of 180 ft/min. The motion is driven by a 55-b.h.p. motor at a running speed of 720 r.p.m., through a flexible coupling to single-reduction spur gearing. Double output-shafts from these gears drive twin sets of worm and spur reduction gears. The final drive shafts carry the slew-race spur pinions, which mesh with the main race wheel bolted to the structure at the top of the travelling tower. The wheel is made up of 12 segments bolted together to form a ring nearly 32 ft in diameter, the inner face of which forms the horizontal track for the slew rollers, mounted under the machinery house, which transmit the horizontal reaction from the mast. Eight of these rollers, mounted in pairs on compensating beams at the front and rear of the mast, give even distribution of the load, and two more pairs of rollers are mounted at each side of the mast to give lateral stability —the whole system, 12 rollers in all, thus performing the function of a large radial bearing.

At the foot of the mast the 580-ton deadweight of the revolving superstructure is carried by a spherical roller bearing that accommodates the changes of alignment accompanying deflections of the structure in addition to transmitting the horizontal reaction.

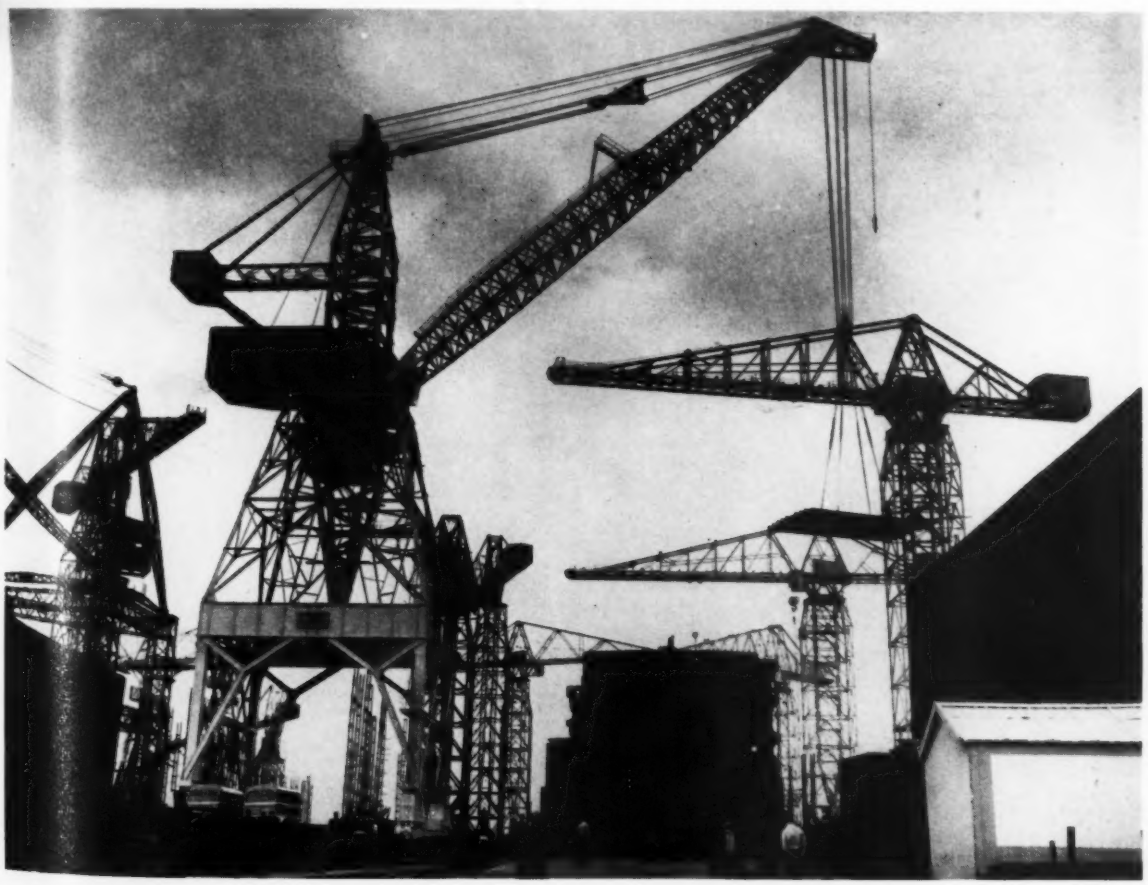
An electrohydraulic brake is fitted to the extension shaft of the slew motor. It is released automatically when the main isolating switch is moved to the 'on' position, leaving the motion under the control of a foot-tramp in the driver's cabin. When the power supply is cut off, the brake comes into operation, and will hold the revolving superstructure in any required position.

Shock-loads caused by sudden stoppages of the motion are prevented from reaching the motor and primary reduction gears by slipping friction-clutches in each of the twin worm boxes. These clutches are of the cone type, in which a predetermined load is applied by means of helical compression springs. The load on the springs is adjusted to transmit the full torque needed to slew the crane and the clutches will slip if the predetermined torque is exceeded by the momentum of the rotating parts.

Travel Motion. The flanged rail-wheels are driven by four 32·5-b.h.p. synchronized motors, one of which is mounted at each corner of the base-structure and drives four of the group of eight wheels through worm and spur gears engaging spur rims bolted to the webs of the rail-wheels. Worm-and-wormwheel assemblies are housed in oil-tight cast-iron gearboxes, the shafts being carried in roller thrust bearings and the gears running in an oilbath.

Flexible couplings are fitted on the extension shafts of the motors. Two of the couplings carry a large-diameter wheel

Having picked up a load from the welding bay the crane will travel down the jetty and place it in position on the super-tanker under construction on the right-hand slipway. All motions are powered by independent motors and can be operated concurrently



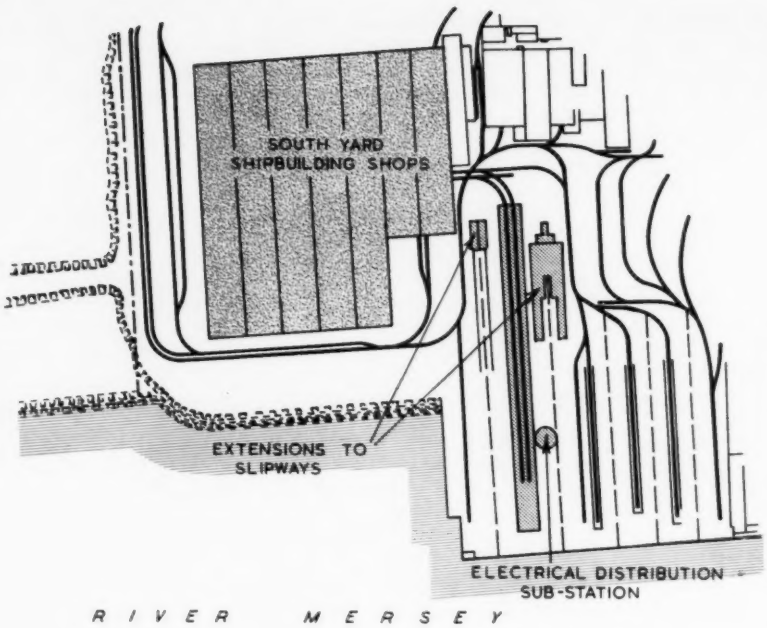


Diagram showing part of the Cammell Laird reconstruction works at Birkenhead. Two 100-ton rail-mounting monotower cranes on the new jetty will transfer large prefabricated sections produced in the refitted South Yard shipbuilding shops to vessels under construction on the extended slipways

energized by a self-contained fully automatic compressor unit, incorporating a 4-h.p. squirrel-cage motor, which is installed in the machinery house.

Current is distributed from a slip-ring collector-column at the base of the mast. The supply cable is passed round a cable-reeling drum of sufficient capacity to allow the crane to travel more than 1,000 ft. Lighting to the value of 200 W is provided in the driver's cabin, 600 W in the machinery house, 100 W in the auxiliary hoist compartment and contactor house, and 3,000 W on the mast, and a 1,000-W heater is available in the cabin. Cables are laid in steel troughs or flexible tubing.

acted upon by an electromagnetic brake. A time-lag is interposed between the actuation of the electric controller and the operation of the brake. Bogies and sill girders are individually compensated to take up irregularities in the track and to spread the load equally among all the rail-wheels in any of the four groups.

Multiple-rope reefing is used to support the jib at its outer end. The bridle rope, which is reefed in four parts between the point of the jib and the bridle frame, is passed round compensating pulleys to equalize the loading on the four parts of the rope. The pulleys through which the luffing rope is reefed in eight parts are also carried on the bridle frame. The main-hoist rope is reefed from the barrel to the mast top and thence to the jib point, on passing over which it is reefed through the three pulleys on the main-hoist return block forming a six-part reefing system.

The return part of the main-hoist rope is reefed between the jib point and the mast top before passing over a Wylie safe-load indicator and down the mast to the levelling barrel —an arrangement that has a levelling effect upon the load path.

Electrics. The crane operates on a 400/440-V three-phase 50-cycle supply. The motors for the main and auxiliary hoist, luffing, slew, and travel motions, are all of the totally enclosed, slip-ring, reversing type, and are half-hour rated with the exception of the main-hoist motor, which operates on a one-hour rating. All are fitted with heavy-duty ball and roller bearings. Every motor is capable of exerting a starting torque of twice the full-load torque with a starting current 2·5 times the full-load current and has an overload capacity of not less than 100 per cent for 15 seconds, in accordance with the requirements of B.S. 2613.

Each motion is controlled by a separate contactor-panel, the sequence-operation of which can be checked without running the motors. Each of the brakes for the various motions can be fed with direct current. Each motion has a suitably rated starting resistance, and the four resistances for the travel motion can be adjusted to obtain equal loadings. Contactor-panels and resistances are installed in a contactor house within the mast structure. Each motion is controlled by a master drum-controller in the driver's cabin. The air-brakes for main-hoist and luffing motions are

Another general view of the Butters 100-ton monotower travelling crane

READY-MIXED CONCRETE PLANT

A HIGH degree of automation has been incorporated in a new plant at Fulham, London, which is planned for an eventual capacity of 1,500 cu. yd. of ready-mixed concrete (sold under the trade name 'Fulcrete') per day. Opened by Greenhams Ready Mixed Concrete, Ltd., the plant was supplied and erected by Winget, Ltd., and the conveyor system supplied and erected by W. W. Brown & Partners, Ltd. The site construction works were carried out by Greenhams, with the exception of the piling to the foundation of the plant which was by Terresearch, Ltd. The Plant Engineering Organization built on site and placed at a height of 65 ft the main hopper weighing 50 tons. The whole of the scheme was completed within four months.

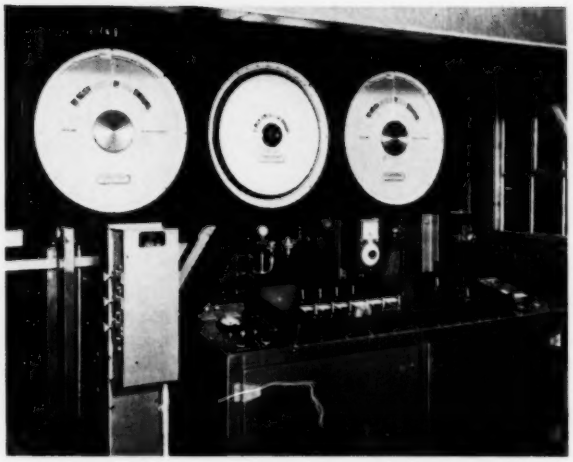
A laboratory on site has been provided to ensure effective control and testing. This is provided with two tanks of 300 gal capacity each for curing up to 120, 6-in cubes at a temperature of 50-70 deg F; also a Dennison 150-tons cube-testing machine reading off in tons. Grading of aggregates and sand is checked once a week and the silt testing of sand is carried out three times a week.

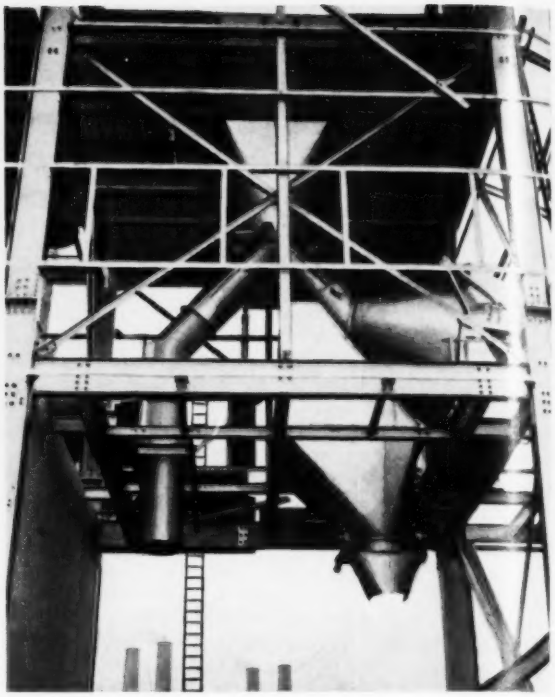
The water and cement content of any one batch is controlled to accuracies of half per cent and the plant handles simultaneously, and at high speed, six varieties of aggregate and three of cement.

The fleet of delivery vehicles is in radio touch with the transport office so that the whereabouts of the concrete can be known to the customer at any time.

Materials are fed to the plant mainly by road but there are also facilities for rail and river transport. Cement, delivered from the Cement Marketing Company, Ltd.'s Wandsworth depot in pressurized vehicles, can be blown directly into any of the silo compartments, of which there are three with a total storage capacity of 120 tons, one 60- and two 30-ton compartments.

The main plant with loading ramp in foreground





The automatic control panel and weighers (Above)
The 'dry leg' mixing hoppers (Right)

Sand and gravel are delivered in tipping trucks from pits in West Middlesex. They are tipped from a 7-ft ramp into one of four ground hoppers, each of which holds 50 cu. yd.

The gates of these hoppers, which are remotely controlled from the main plant, feed two conveyors which transport the material up to a height of 85 ft into one of six hoppers in the main plant. The first and lower conveyor is 220 ft long, 20 in wide at an angle of 19 deg travelling at 300 ft/min to give a discharge of 150 tons/hr. The second conveyor is 170 ft long, 24 in wide at an angle of 18 deg travelling at 220 ft/min to give the same discharge of 150 tons/hr.

The lower conveyor is only 20 in wide to decrease the angle to curve and thus reduce the length of the conveyor.

View of the second level conveyor

Electrical interlocks prevent the bottom conveyor operating before the upper conveyor and also if one conveyor is switched off the other is cut out automatically.

The total hopper capacity on the plant is 300 cu. yd., made up of two hoppers of 75 cu. yd., one each for sand and $\frac{3}{4}$ in aggregate and four of 37$\frac{1}{2}$ cu. yd. capacity, one each for sand, $\frac{3}{4}$, $\frac{3}{4}$ and 1$\frac{1}{2}$ in aggregate. All these hoppers are grouped around the three central cement silos.

The cement silos are fitted with filters to allow air extraction during pressure filling, and each aggregate hopper and each cement silo is fitted with high and low level indicators showing the state of the material quantities. The indicators operate in a control cabin at the base of the plant. From the same point, one man can operate the conveyor, the gates to the ground hoppers, and the pivoted distributor at the top of the plant, which will chute the material from the conveyor belt to the correct hopper.

Water is stored in a 2,500-gal tank on the ground, being pumped up to a 400-gal tank on the plant.

Weighing of materials is carried out in four hoppers. Two hoppers are each of 16,000 lb capacity for sand and gravel, one is of 3,250 lb capacity for cement, and one is of 2,000 lb capacity for water. The aggregates are discharged through radial gates and the cement through semi-rotary valves all operated by pneumatic rams. The cement weigh-hopper is also fitted with a vibrator to assist discharge, and a preset automatic cut out. The hopper containing sand is fitted with a moisture meter which registers on the operator's control panel.

From the weigh-hoppers the materials are fed either into a 4-cu. yd. tilting drum mixer, or into a chute direct to a truck mixer. The mixer is driven electrically and tilted by pneumatic rams, either from the operator's floor or the mixing floor. The time of mixing can be controlled and discharge cannot be permitted until a given cycle is over. Provision is made for replacing the 'dry leg' with a second 4-cu. yd. mixer at a later date. The concrete for the mixer is fed into a hopper and then into either a truck mixer or an agitator, or directly into a tipper lorry.

Among the features of this earthmover, which has a lifting capacity of 12,000 lb, are a 105-h.p. diesel engine, automatic transmission and torque converter, and a 2-cu. yd. general utility-bucket. All moving parts of the arm are enclosed by a box-casing section and are always below the sides of the driver's cab

BRITISH VERSION OF THE 'TROJAN' TRACTOR SHOVEL

By K. Mumby

With the first British version of the American *Trojan* tractor-shovel, the British Materials Handling Division of The Yale & Towne Manufacturing Co., enter the earthmoving field. The 154LD, with a lifting capacity of 12,000 lb and a 2-cu. yd. general utility bucket, is now in production at Wednesfield. Powered by a 6-cylinder 105-h.p. Leyland diesel engine and fitted with Allison automatic transmission and torque-converter and Kirkstall axles, the 154 has an impressive specification. Its outstanding characteristic, however, is the design of the lifting arms. Their action is shown in the illustrations, which were taken during an operating cycle and give a clear indication of the safety and full visibility afforded the driver at every stage and the straight thrust exerted during crowding upon the cutting edge of the bucket.

A Major Influence on Performance

In this outstanding arm-design, which is protected by U.S. and Canadian patents, all moving parts are enclosed by a welded box-section casing and are always below the sides of the driver's cab, and out of reach of his head and forearm, even when the bucket is fully raised. The double-acting hydraulic lift-rams operate horizontally and their thrust is exerted in a line that is almost parallel with that of the tractive force. Thus the power transmitted by the hydraulic and mechanical systems is brought to bear with the least possible wastage on the cutting edge of the bucket during digging, dozing, grading, or stripping operations, without any tendency toward jack-knifing and the loss of traction that would result from a lifting of the rigid front axle.

The functional objectives of these design-features, which embrace both driver and machine, are realized in the performance of the tractor-shovel. Able to see what he is doing, and released from conscious or unconscious preoccupations concerning his own safety, the driver is able to work faster and more accurately. It is evident that the efficiency of the tool can be well exploited. Obviously, also, a high efficiency is available—though its value cannot be measured in terms of engine-horsepower, drawbar-pull, and the breakout force at the bucket. When due allowance has been made for the energy that must necessarily be absorbed by a torque-converter, power-shift transmission system, and the double-reduction axles needed to achieve the wide final ratio of engine speed to hub speed in machines of this type, there can be no doubt that the effective force exerted at the cutting edge of the bucket represents an

Fig. 1. This view shows the robust construction of the rear wheel steering linkage

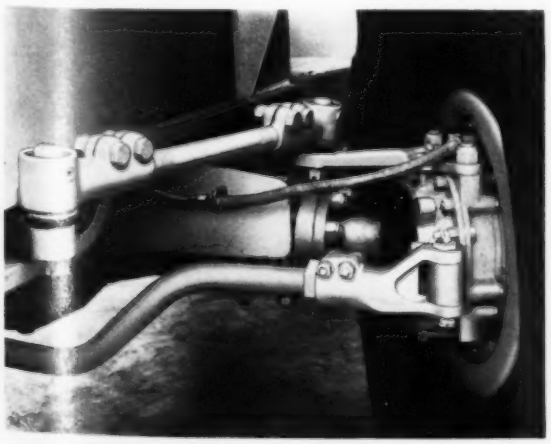


Fig. 2. Showing the neat and well-planned layout from the driver's position

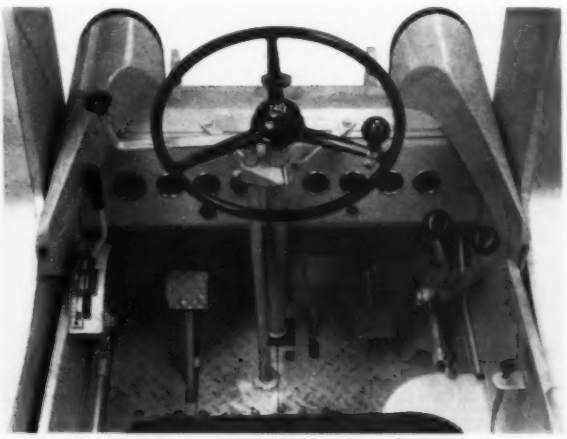
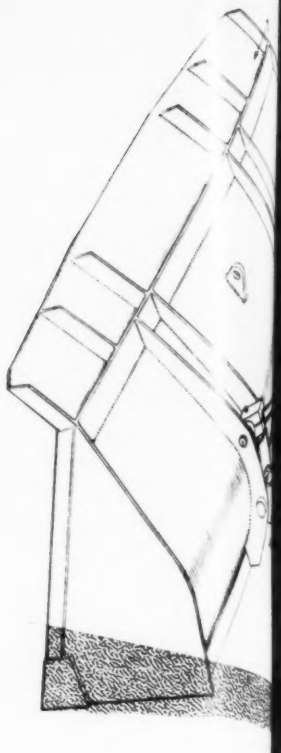


Fig. 3. Artist's cut-away drawing of the Yale & Towne 154 LD 'Trojan' in the digging position with cutting edge of bucket 8 in below ground



KEY

1. 2-cu. yd. general-utility bucket of Cor-Ten steel
2. Bucket-level indicator
3. Double-acting bucket-tilt rams
4. Levelling arm
5. Steering box giving 20/1 reduction
6. Footpedal for servo-assisted hydraulic four-wheel brakes
7. Rear-drive disengage lever
8. Hour-meter
9. Engine oil-pressure gauge
10. Water-temperature gauge
11. Fuel gauge
12. Ammeter
13. Transmission-clutch oil-pressure gauge
14. Torque-converter temperature gauge
15. Hydraulic-fluid pressure gauge
16. Horn button
17. Lift control lever
18. Bucket control lever
19. Engine stop control
20. Forward-reverse selector lever
21. Speed-range selector lever
22. Connecting arm
23. Left-arm pivot
24. Hydraulic fluid 20-gal reservoir
25. High-pressure flexible hydraulic hose
26. Two 12-V 67-Ah Exide batteries
27. Exhaust silencer
28. Steering system hydraulic-fluid reservoir
29. Leyland 105-h.p. diesel engine
30. Oilbath air-cleaner
31. Water-cooled 5-gal radiator
32. Hamworthy hydraulic control valve
33. Spiral-bevel differential gearing to steer-axle
34. Kirkstall double-reduction steer-axle
35. Standard 14-in × 24-in pneumatic tyres
36. Ball-and-socket steering linkage
37. Double-acting lift ram
38. Front and rear transmission with disconnecting clutch to rear output-shaft
39. Allison 3·5/1 torque-converter with epicyclic gearing
40. Transfer gears to output at propeller-shaft level
41. Lockheed 'Hydrovac'
42. Levelling arm bellcrank
43. Stein Atkinson Vickers hydraulic steering booster
44. Welded main-frame of ¾-in steel plate and 8-in × 3½-in channel
45. Epicyclic hub-gears
46. Kirkstall rigid-drive axle
47. Spiral-bevel differential to rigid axle
48. Box-section lifting arm
49. 20-gal fuel tank
50. Driver's seat with horizontal adjustment

unusually favourable proportion of the brake-horsepower delivered by the engine.

Despite the insistence on safety and the fixed reverse-curve of their elbows, the lifting arms are able to raise the bucket to a discharge-height of 8 ft 7 in under the cutting edge, when tilted to an angle of 50 deg, with an outreach of 2 ft 8 in beyond the front tyres. Better tipping clearances are offered by competitive tractor-shovels at the expense of the tilt angle, but a 50-deg inclination satisfies the minimum requirement for dealing with sticky materials such as wet earth or iron ore. At 10 ft 9¾ in under the hinge of the bucket, the 154 provides a lift that is well above the average attained with standard arms not designed specifically for high lifting. The 2 ft 8 in outreach is exceptional. The clearance in both directions is adequate for discharging into hoppers and over the high sides of rear-dumpers, and enables the bucket edge to be used for levelling off and distributing the load.

Stability

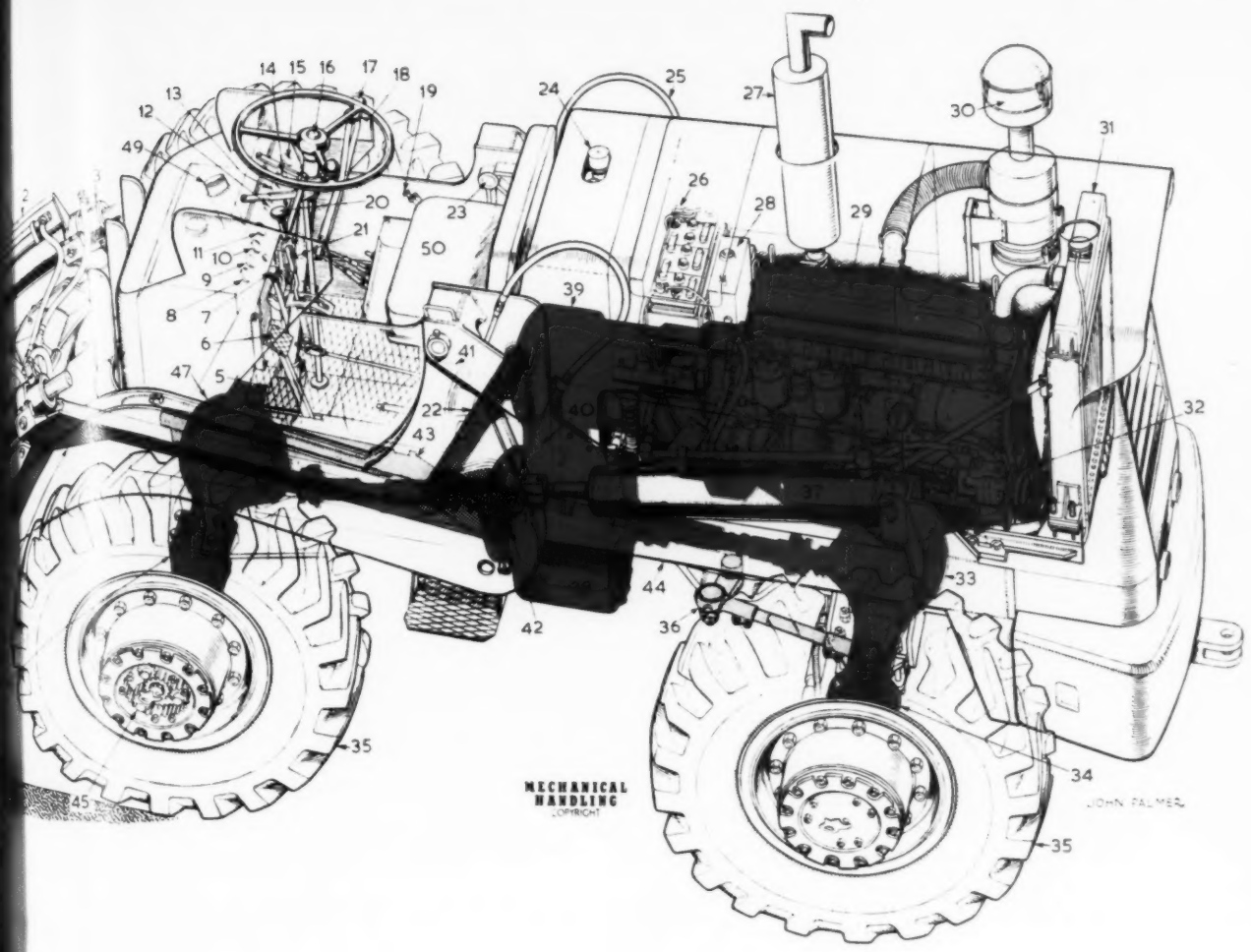
Yale have given the 154 the conservative stability-rating of 6,000 lb for the operating load. This figure represents only 50 per cent of the S.A.E. rating for the tipping load at the centre of gravity of the bucket—the load at which the rear wheels begin to rise. Since makers vary widely in their assessment of the operating loads for their machines, the S.A.E. figures form a better basis for comparison than an arbitrary stability factor. If the ratio of tipping load to engine horsepower is taken as an index of potential productivity, the Yale machine, with a ratio of 114, shows up favourably in relation to other British tractor-loaders.

Resistance to tipping has been achieved by the designers of the 154, without recourse to heavy counter-weighting, by means of a 7-ft 8-in wheelbase, which is among the longest in its class, and a track of 6 ft 3 in, which is above the average, and by building plenty of weight into the chassis, with the result that 55 per cent of the total weight is distributed along the rear axle when the machine is unladen. As in Yale fork trucks, the counterweight is adjusted to meet the precise requirements of the fully fitted machine.

Handling Characteristics

A facility for making 'tight turns' was rated lower in priority than stability, safety, and digging efficiency, when the inevitable compromise between conflicting requirements was called for in the design. Thus a long wheelbase and wide track have been insisted upon as the best means of counteracting the bouncing and jack-knifing tendencies that might otherwise dissipate tractive effort and reduce stability on rough ground and sharp gradients. Where possible, however, the requirements have been reconciled or common ground has been found. In the method of weight-distribution, for instance, the mass needed to counteract the overturning moment induced by the loaded bucket is provided largely by building up weight in the chassis, with the least possible dependence upon a rear counterweight, thus reconciling the stability requirements in the laden and unladen conditions with the need to keep down the overall dimensions of the machine by increasing the one parameter—the weight—that negates none of the requirements.

A turning radius of 22 ft, and lifting and lowering speeds of 8 seconds and 7 seconds to and from the highest discharge position, might suggest an average loading performance, though on longer hauls an increasing advantage would be gained as the machine approached its maximum travelling speed of 21 m.p.h. in the forward or reverse direction. Assumptions based solely on the specification, however, would fail to take account of the advantages derived by the average driver from the excellent handling characteristics of the 154. The safety and visibility afforded by the arm geometry, and the flexibility resulting from a first-class power-unit and transmission combination, enable him to maintain a high standard of operational efficiency, which can be measured by the cycle-times recorded during site-tests.



Though these results must be attributed to the balanced characteristics of the whole machine and are greater than the sum of all the factors into which they can be broken down, certain features, in addition to the major design-features already mentioned in connection with safety, visibility and stability, can be isolated as exercising a significant influence. The Leyland UE350 engine, developing 105 b.h.p. at 2,000 r.p.m., has a power-curve admirably suited to the operating conditions encountered by tractor-shovels. The optimum torque-range is maintained under all conditions of loading and through a wide range of speeds by a torque-converter of 3·5/1 ratio in conjunction with a constant-mesh epicyclic gearbox providing a choice of low, intermediate, and high ranges in the forward and reverse directions. Selection of speed and direction is effected by an hydraulic control-valve assembly controlling the flow of oil to multidisc clutches, which allows the driver to retain the feel of the load that is being transmitted while relieving him of the need to operate a clutch pedal or gear lever and of the responsibility for preventing overloading or overrunning of the engine or for synchronizing its speed with that of the propeller shaft when making a gear-change.

Speed-changes and changes of direction can be made regardless of load and under full throttle-opening. Engine and fuel-pump characteristics are matched positively and automatically by an hydraulic throttle-governor, and the risks of over-injection or excessive inertia-stresses are removed. Working effort can, as a result of these self-regulating systems, be exerted continuously, with great benefit to the productivity of the machine, and the flexibility with which tractive effort can be transmitted enables the driver to give his full attention to bucket-loading.

The bucket control levers return automatically to the neutral position when released, thus freeing the driver from the responsibility of making sure that the centre of gravity is not raised by an accidental over-elevation of the arms and the bucket is not tilted and discharged when travelling over rough ground. Bucket and hoist motions are independent and the bucket can be rolled back at ground level, thus enabling heaping loads to be won at every pass, including those taken from windrows and low piles. One-unit control of all bucket motions is exercised by a double-acting hydraulic valve incorporating a float position and a built-in relief valve. Levelling of the bucket for digging or grading is facilitated by an indicator.

Maintenance

Users of Yale equipment will have no hesitation in affirming that the name of the company constitutes a warranty of the quality of their products. In accordance with the custom followed in the manufacture of their fork trucks and other handling machines, the materials and components used in the tractor-shovel have been stress-treated and approved by the Yale control research division in U.S.A. and manufacturing procedures at Wednesfield, as in the other factories of the group, conform with the quality-control standards laid down for all Yale products.

Reliability is the principal aim behind this insistence on strict control of materials and processes, and Yale are among the manufacturers who go to enormous pains to

Fig. 4a. The power exerted by the hydraulic and mechanical systems is brought to bear in almost parallel lines upon the cutting edge of the bucket when the 154 is digging

Fig. 4b. Fabricated from wear-resisting 'Cor-Ten' steel, the standard 2-cu. yd. bucket spans the wheels

find the best part for the job and the best material for the purpose. For the fabrication of the bucket for their tractor-shovel they are using the high-strength low-alloy *Cor-Ten* steel from the strip mills of Colvilles, Ltd. Though having a low carbon content and excellent welding properties, *Cor-Ten* has an effective strength 50 per cent higher than that of ordinary mild steel and four to six times its resistance to atmospheric corrosion. It is also resistant to abrasion, impact, and fatigue. These properties have been exploited in the manufacture of railway wagons, tanker vehicles, scrapers, and skip-hoists, by reducing the thickness of the section and hence the weight of the structure. In the 154 *Cor-Ten* is used in the full thickness of section to prolong the life of the bucket by reducing wear through attrition. It has the incidental advantage of facilitating the discharge of sticky materials by retaining a smooth hard surface in contrast to the pitted buckets that result from the relatively rapid deterioration of ordinary mild steel.

The choice of the Leyland power unit, Allison torque-converter and transmission, Kirkstall axles, Hamworthy hydraulics, Vickers steering booster, and Lockheed servo braking unit, has been made on the same principle, and reliability in service may be expected from all the parts that could be a source of annoyance and expense if less attention had been paid to the requirement of trouble-free service.

Wear in heavily worked moving parts is automatically reduced by the employment of oil-hydraulic transmission systems, in which moving parts are bathed in a protective film of wear-absorbing non-corrosive cooled hydraulic fluid, and the possibility of damage through abuse is virtually eliminated by taking the output through a torque-converter and substituting an oil-controlled constant-mesh epicyclic system of transmission for the manually operated clutch and gearbox. Maintenance costs, therefore, should not be heavy on the 154, but accessibility for servicing has not been overlooked in the design.

Productivity

Yale base their rating of 6,000 lb for the operating load of the tractor-shovel on 50 per cent of the S.A.E. tipping load (the load at the centre of the bucket at which the rear wheels begin to rise). This is their estimate of the safe capacity of the machine when working under average conditions of running surface, gradient, and travelling speed. It means, for example, that the tractor-shovel, fitted with a 2-cu. yd. bucket, can handle a full payload of earth, sand or gravel with a density of 140 lb/cu. ft. on rough, mainly level, ground, or gradients of up to 20 per cent (1 in 5), if the surface is smooth and hard, and can travel with safety under these conditions at speeds of 8 m.p.h. Under the same conditions, a full payload of iron ore could be handled in a $1\frac{3}{8}$-cu. yd. bucket, or of cement in a $2\frac{3}{4}$-cu. yd. bucket. On a surface that was smooth, level, and hard, the speed could be raised to 16 m.p.h. when travelling with a full load.

Average manœuvring time is stated by Yale to be 0·6 minutes for a 154 fitted with a 2-cu. yd. bucket and working to capacity. This is the time consumed in winning the load, dumping, and turning at the end of each cycle. Taken in conjunction with travel-time and an approximate lost-time factor, it should provide a reasonably accurate basis for calculating average productivity, if due allowance is made for the fact that various functions can be performed while the machine is travelling.

Thus the 154 should be able to maintain a cycle-time calculated as follows when handling a 2-cu. yd. load and travelling in second gear over a distance of 30 yd each way:

$$\text{Cycle time in minutes} = M + D/T$$

where M = manœuvring time in mins
D = distance travelled in feet
T = travel speed in ft/min

$$= 0{\cdot}6 + \frac{30 \times 3 \times 2}{8 \times 88}$$

$$= 301{\cdot}2/352$$

$$\text{Cycle time in seconds} = 301{\cdot}2 \times 60/352 = 54.$$

These ratings were verified under site conditions during tests carried out at the St. Albans Sand & Gravel Co.'s pit at Smallford with a 154 tractor-shovel fitted with a 2-cu. yd. bucket. For one of the tests washed sand was transferred from a stockpile to a location some 30 yd away. The ground was rough but firm and the machine travelled in second gear. Times recorded over 30 loadings showed that the average time consumed during a working cycle was 50 seconds, with the bucket filled to capacity at each trip. This rate of handling, if maintained throughout the day, would produce a yardage of 1,224 cu. yd. in an $8\frac{1}{2}$-hr day.

Fig. 4c. Independent hydraulic motions enable the bucket to be rolled back at ground level and heaped loads to be won and to be carried at wheel-level

The actual average daily figure worked out at approximately 960 cu. yd. for a minimum working period of 8½ hours, which means that the time lost was in the region of 1·9 hours a day, or rather less than 13 minutes in the hour.

On a longer run, of 70-80 yd, on which it was possible to use top gear for part of the travel, the average operating cycle-time was 60 seconds. In other respects the conditions were similar to those of the previous test and the daily average was in the region of 800 cu. yd. of sand.

Two further tests were conducted at the same sand-pit under partially simulated conditions to represent the loading of the material into vehicles. In the first, the travelling distances were 10 yd each way at the cut and 10 yd each way between stockpile and vehicle. The test was run over 25 loading cycles, and an average time of 30 seconds a cycle was recorded. For the second test, the distance travelled to the tip was raised to between 25 and 30 yd and was partially over rutted ground. This test was continued for a period of 60 minutes, during which 75 full loads were handled, the cycle-times being 35-50 seconds, and 150 cu. yd. of material was moved.

From the manufacturers' own records of tests they have themselves conducted, we quote four in which the 154, again fitted with a 2 cu. yd. bucket, was handling loose earth from the stockpile. In the first test it performed the manœuvres of filling the bucket, dumping, and turning, in 36 seconds. In the other three tests, the tractor-shovel tipped the material into a lorry. A 6-cu. yd. lorry was loaded in 1·8 minutes, the machine making three trips, and 189 cu. yd. of material was handled in an hour. For loading a 10-cu. yd. lorry, the handling rate was 200 cu. yd./hr, the five trips needed to load the lorry to capacity being made in 3 minutes. In the third of this second group of tests, 300 ft. of travel were introduced and the rate per hour was found to be 72 cu. yd.

These figures are abstracted from information received from outside sources. They are, however, confirmed by first-hand impressions of a 154 seen at work recently under highly adverse conditions on M. J. Gleeson's contract at the Crystal Palace, London. Digging earth from an old stock-pile and loading it into a high-sided lorry, the tractor-shovel was manœuvring on a small patch of churned-up clay and sand approached by a steep gradient. In the intervals between using its bucket to shove mud-bound lorries into and out of the loading position and up the grade, it was performing its regular task of moving earth at speeds well above those that would be deduced from the cycle-time ratings of the manufacturers. It is unfortunate that we have no evidence of digging in hard compacted material, for the behaviour of the tractor-shovel bears out the design indications and creates a strong impression that this is essentially a digging machine capable of exerting a considerable force at the cutting edge of the bucket.

Useful though it is, evidence of this kind does not tell the full story. There being no standard against which to assess the full significance of the figures obtained, the results are not strictly comparable with those recorded for other tractor-shovels operating under broadly similar conditions. So many variables are involved that true comparisons are almost impossible to obtain, but tests made by an independent organization under strictly controlled conditions will go a long way towards a relative assessment of these machines.

Yale & Towne are submitting the 154 LD to the trials conducted by the Military Engineering Experimental Establishment in accordance with the test code agreed with the Federation of Manufacturers of Contractors' Plant. These tests take five weeks to complete and are, as may be imagined, really comprehensive. Every detail of the specification is examined and the machine is given a dynamometer test and operational trials involving the handling of virgin soil, clay, and graded aggregates, during which such features of stability, output, mobility, bucket capacity, and the efficiency of the various attachments, are measured against

Fig. 5 (above). View of the twin double-acting tilting rams

Fig. 6. A works view with bonnet removed to show the neat engine layout. Position of air cleaner has now been modified as shown in Fig. 3

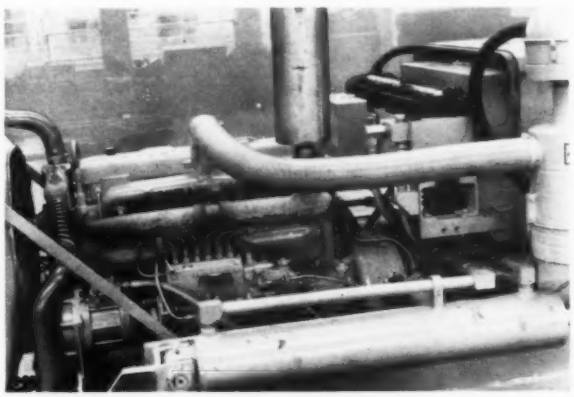


Fig. 7a. At every stage of the lifting cycle the arms are below and forward of the driver's cab and the operator's safety is assured

Fig. 7b. All moving parts of the lift-arm assembly are fully enclosed. The reverse-curve elbows remain below the sides of the cab even when the bucket is fully raised

basic standards. Unfortunately the results of these tests will not be available until after this article has gone to press, but the announcement that the 154 is being submitted to them indicates that the manufacturers have confidence in their equipment and in the accuracy of their specification and the fairness of their ratings.

Abridged Specification

It is impossible to quote the specification in detail, but the principal features are summarized below.

Chassis. Profiled steel plate of $\frac{3}{8}$ in to $\frac{3}{4}$ in section, with reinforcing members formed from 8 in × $3\frac{1}{4}$ in rolled steel channel, are welded to form a rugged chassis of sufficient weight to provide stability with the minimum of additional counterweight. The axle-mountings are supported on heavy box-section carriers—the front carrier, for the drive axle, forming part of the main frame while the carrier for the rear steer-axle is suspended on pivot-pins to afford freedom for lateral movement. Pivot-pins for the lifting arms, levelling arm, and lift ram, are carried by brackets integral with the chassis.

Engine. The Leyland UE.350 6-cylinder diesel engine is mounted over the rear axle. With a 3·96-in bore and 4·75-in stroke, it has a displacement of 351 cu. in. In the stripped condition, it is rated at 105 h.p. at 2,200 r.p.m. and develops a maximum torque of 270 ft-lb for a fuel consumption of 28 lb/hr.

Fuel is supplied from a tank of 20-gal capacity. Air is admitted through an 8-in-dia oilbath cleaner and precleaner. The radiator is of 5-gal capacity and is fitted with an oil-cooler to maintain a normal running temperature of around 180 deg F. Lubricating oil is circulated from the crankcase sump at a working pressure of 60 p.s.i. at 1,000 r.p.m. engine speed.

Electrics. Current for the electric starter, lighting, ignition, and instruments, is generated by a Simms 24-V generator and stored in two 12-V 67-Ah Exide batteries housed in an easily accessible container behind the driver's seat. The charger cuts in when the engine is running at about 800 r.p.m.

Transmission. The output from the engine is taken through an Allison CRT 3331.1 *Torqmatic* transmission employing a 3·5/1 torque-converter operating at an oil-temperature of 200-220 deg F, which is followed by three-stage constant-mesh planetary gears engaged by hydraulic clutches operated through a control valve at an oil-pressure of 100-125 p.s.i. Transfer gears provide front and rear outputs at a propeller-shaft level, and a clutch enables the drive to the rear steering axle to be disconnected when the machine is travelling on the road.

Kirkstall double-reduction axles are fitted front and rear. These employ spiral bevel gearing, which can be lubricated with standard oils, in the differential, and epicyclic hub-gears for the final reduction.

Adjustment of the crown wheel is provided for by vernier nuts backing the differential bearings and the complete axle-centre can be removed as a unit from the casing for servicing. The hub gears are driven by floating sun-pinions splined to the universal-joint stub-shafts, each pinion mating with three planet-pinions carried on the wheel hub. The reaction annulus gear has an excess of tooth-length for engaging the splines on the annulus carrier; the slackness in the fitting ensures that the annulus can float and counteracts any misalignment caused by slackness in the hub-bearings. The design of the carrier, which is splined to the hub and supports the outer hub-bearing, ensures that the splines carry none of the imposed load.

In the steering axle the swivel bearings and universal-joint housings are fully enclosed and easily lubricated and the arrangement by which the steering arms are mounted gives great rigidity to the swivel-trunnions. Universal joints are of the Birfield constant-velocity type. As a result of the secondary reduction they and the half-shafts and stub-shafts

Fig. 7c. At maximum tipping height the bucket can be tilted at 50 deg and the outreach of the cutting edge is 2 ft 8 in beyond the front tyres

carry less than a quarter of the torque at the road-wheels and have been reduced to compact dimensions.

Brakes. Kirkstall hydraulic 15¾-in-dia internal expanding rigid-shoe brakes, with an effective frictional area of 148 sq. in., are fitted to all four wheels. Hydraulic braking effort is assisted by a Lockheed *Hydrovac* servo unit incorporating a vacuum power-cylinder and control-valve and an hydraulic slave-cylinder. A mechanical transmission-brake operating on the propeller-shaft is used for parking.

Steering. The rear wheels are steered through a normal Ackerman linkage and a screw and rocking lever mechanism producing a reduction ratio at the steering wheel of 20/1. Manual effort is assisted by a Stein Atkinson Vickers hydraulic booster inserted between the drop-arm and the push-rod.

Lifting and Levelling Arms. Lifting arms are of steel plate fabricated to form a box section of great strength. They pivot from brackets on the sides of the chassis and are profiled to form an elbow below the pivot-point before taking a reverse curve forward, with the result that the moving arms remain below and in front of the driver during the whole of the lifting motion and never come within his reach. The levelling arms operate through bellcranks pivoting on the elbows of the lifting arms and connecting rods with pivot-points on the lifting arm brackets.

Bucket. The standard general-utility bucket is of 2 cu. yd. capacity, to S.A.E. rating, but alternative capacities of 2¾ cu. yd. and 1¾ cu. yd. are available for handling lighter or heavier materials. All buckets are fabricated from Colvilles *Cor-Ten* steel. Compared with mild steel, this alloy has a 50 per cent higher yield-point, four to six times the resistance to atmospheric corrosion, a greater resistance to fatigue and abrasion—especially pronounced when abrasive action is accompanied by corrosion, and a 60 per cent greater resistance to denting. Reinforcing ribs and wearing plates at the base and heel are incorporated in the construction.

Hydraulic Lift and Tilt Systems. The lifting arms are raised by two horizontally mounted double-acting rams of 5½ in dia bore and 30-in stroke. The bucket is tilted independently by two smaller double-acting rams of 4½-in bore and 15-in stroke. All bores are honed and all pistons are chromium-plated.

Hydraulic fluid is stored in a 20-gal reservoir, electrically welded and fitted with baffles. The tank is provided with adequate access for cleaning and a filter is fitted to the suction port. The oil is pressurized to a working pressure of 1,800-1,900 p.s.i. by a Hamworthy gear-type pump with a delivery rate of 42·7 gal/min at 2,000 r.p.m. Pressure is controlled by a Hamworthy double-acting control-valve incorporating a float position on the lift circuit and an adjustable built-in pressure-relief valve

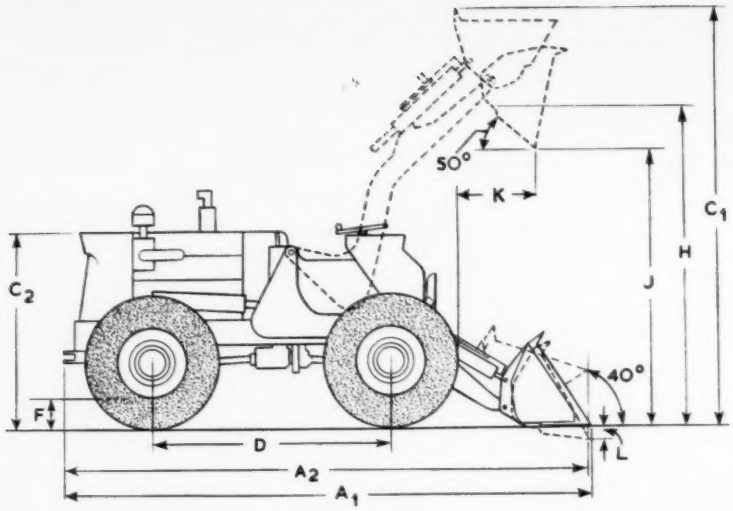
Controls. The driver sits in a well-designed cabin from which he has full visual command of the bucket at all stages of the operational cycle. His seat is adjustable for forward and backward movement and all controls are within easy reach. Those in constant use during digging and loading operations are limited to the large-diameter steering wheel; the forward-reverse selector, the stem of which is attached to the steering column and cranked over to bring the operating knob in line with the driver's left hand as it rests upon the wheel; the brake and accelerator foot-pedals to the left and right of the column; and the bucket and lift control-levers for right-hand operation.

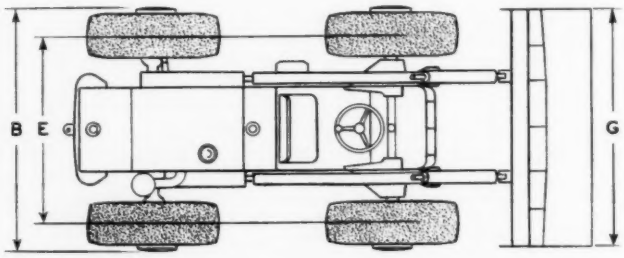
The three speed ranges of the epicyclic gearbox are selected by a hand-lever at the left of the cabin, and there is no danger of confusing this control with the hand-levers used to disconnect the drive to the steering axle and to apply the parking brake. The horn button is mounted on the top of the steering column and the strangler-knob for stopping the fuel supply to the engine is to the right of the driver's seat.

Controls are safeguarded where possible against accidental misuse. Thus, for example, there is a gate to prevent the speed-change lever being shifted directly from low to high or high to low ratios without passing through the intermediate stage; an hydraulic throttle-control gives positive actuation of the throttle without the lost motion associated with the conventional linkage; the spring-loaded hydraulic control-levers return to neutral and arrest the motion of arms or bucket when released by the driver.

Four positions are available for the lift-arm lever giving lift, lower, float, and down-pressure for digging, and two positions on the bucket-lever for roll-back and tilt. Both levers can be operated simultaneously. A level-indicator mounted on the right-hand bucket cylinder can be seen clearly from the driver's seat.

Instruments are mounted on a panel occupying the full width of the cabin. They comprise fuel gauge and ammeter; an hour-meter for determining the due dates for lubrication and maintenance; instruments indicating the engine oil-pressure and water-temperature, the pressures of the hydraulic fluid in the bucket and lifting arm systems and the transmission-clutch circuit, and the temperature of the oil in the torque-converter (a rise in which warns the driver that he is operating in too high a speed range); a light-switch for the joint control of dashlights, headlamps and rear lights; and combined key-operated switches for the ignition and starter motor. The excess-fuel button on the injection pump assists starting in sub-zero temperatures and returns automatically to the off position when the engine is running.





TURNING RADIUS { OUTSIDE FRONT DRIVING WHEEL – 20 ft 4 in
OUTSIDE REAR DRIVING WHEEL – 22 ft 0 in

Fig. 8. Outline drawing showing the main dimensions of the Trojan

TABLE 1

Rated Operating Speeds for the Yale 154 Tractor-Shovel

	m.p.h.	seconds
Travelling speed, maximum forward and reverse—		
Low range	3	
Intermediate range	8	
High range	21	
Lifting time, ground-level to full height		8
Lowering time, full lift-height to ground-level		7
Bucket forward tilt, through 50 deg		1⅗
Bucket rollback, through 40 deg		1⅗
Average manœuvring time per cycle, with 2-cu. yd. bucket (load, dump, two turns)		36

Attachments. Scarifier-teeth are available for fitting to the rear end of the bucket. They hang downward and operate as rippers when the machine is travelling backward and are retracted upward automatically when the tractor is travelling forward and the bucket is digging. When not needed, they are retained in the upright position out of the way.

The bucket can be replaced by a bulldozer blade, and also by a fork or crane-hook attachment. The forks can be tilted forward and backward by means of the bucket rams and will support a rated operating load of 6,000 lb at 24 in from the heel. The crane attachment has a rating of 5,000 lb at an outreach of 34 in, giving a stability in accordance with the British Standard requirements for mobile cranes.

TABLE 2

Static Ratings of Yale 154 Tractor-shovel Fitted with 2-cu. yd. Standard Bucket

		lb	b.h.p.	in
Tipping load, S.A.E. rating		12,000		
Operating load		6,000		
Carrying capacity		8,000		
Breakout force		15,000		
Weight		19,150		
Engine horsepower			105	
Overall length—				
bucket resting on ground	(A_1)			220
bucket in carrying position	(A_2)			218
Overall width	(B)			93
Overall height—				
bucket fully raised	(C_1)			171
bonnet	(C_2)			81
Wheelbase	(D)			92
Track	(E)			75
Ground clearance	(F)			15
Bucket width, standard	(G)			90
Maximum height under bucket hinge	(H)			29·75
Maximum height under bucket tilted at 50 deg	(J)			106
Outreach from tyre to cutting edge of bucket at maximum tipping height and 50 deg tilt	(K)			32
Digging depth, recommended maximum	(L)			8 12
Turning radius—				
outside front tyre	(M_1)			244
outside rear tyre	(M_2)			264

Demonstration of Heavy-Duty Side-Operating Fork Lift Transporters

The Traveloaders at the Lackenby Universal Beam Mill take the beams from the delivery conveyors, transport them to the stock-yard or load them on to rail wagons or road vehicles. They work three eight-hour shifts and are operated by one man. Height of lift 12 ft, power unit Cummins diesel engine 125 b.h.p.

THE Lackenby Universal Beam Mill of Dorman Long (Steel), Ltd., which cost upwards of £30,000,000, is claimed to be the largest in Europe and the most modern in the world with a planned output of over 10,000 tons per week. Apart from universal beams, in which the company specializes, the works also produce billets, rods, bars, and narrow strips. Universal beams offer greater strength than the former British Standard Sections, thus providing for a reduction in the cost of fabrication and increasing the competitive capacity of structural engineers particularly overseas.

Commercial production of beams varying from 36 to 6 in deep and up to 60 ft in length commenced in July 1958, and the mill now operates on three shifts, six days a week. As in every industry, a substantial proportion of the production cost of beams, and other products, is represented in the cost of handling, storage, and transport, including the time, labour and equipment involved.

Hitherto, movement of beams in the mill has been performed by five overhead cranes, electrically powered, each with a capacity of 15 tons, operating upon gantries some 3,000 ft long. However, the considerable increase in the demand for steel beams for constructional purposes particularly for export, has created unforeseen congestion even with this number of overhead cranes. Furthermore, beams for export must often be held in store for varying periods awaiting shipment. Since the gantry cranes can only operate over relatively short distances without impeding one another it became essential to provide more flexible means for independently handling and storing those beams, not required for immediate despatch, along the full length of the floors covered by the cranes, and even in outside storage areas which they cannot serve.

After consideration and experiment Dorman Long decided to use *Traveloader* heavy-duty, side-operating fork lift transporters, of 15 tons capacity, diesel powered, manufactured by Otis Elevator Co. (Baker Industrial Trucks Division) and supplied by the sole concessionaires for the United Kingdom, Materials Handling Equipment (Great Britain), Ltd., who are also the sole licencees under the British Patents owned by Otis for these machines. The *Traveloaders* are now working on three 8-hour shifts, six days a week, handling parcels of beams up to 15 tons in weight.

An impressive demonstration which took place at Lackenby by courtesy of the directors of Dorman Long (Steel), Ltd., and attended by a large number of executives of the leading steel and heavy engineering companies, port authorities and of British Railways, showed the facility with which these giant machines operated by one man, could pick up a heavy parcel of lengthy beams from the rollers, transport them at speed to the other end of the mill, and then either stack them—up to 12 ft—or load them into rail wagon, or road vehicle. Since the *Traveloader*, unlike the orthodox front-end-loading fork truck, loads and unloads at the side, and is only 9 ft wide, it was shown that, irrespective of the length of the load, up to 60 ft in some cases, it could operate in an aisle only slightly wider than the unit, thus saving valuable production and storage space, moreover at all times the driver had excellent visibility. When in transit the load is carried securely lengthwise along the twin decks, over the wheels instead of on forks at right angles to the unit as would be the case with a conventional fork.

The *Traveloader* carries no balance weights, to ensure stability of the machine during loading, unloading and stacking operations, four hydraulic stabilizer jacks operate from the side of the machine to ground level, thus holding it rigid, and are retracted again by the driver before moving off.

To facilitate entry and retraction of the forks when picking up or setting down a load, the mast assembly can be tilted 5 deg forwards or backwards. To permit the loading and unloading of high-sided rail wagons which would not be possible with forks the *Traveloader* is also fitted with twin crane arms which, when equipped with a hook attachment, enables the machine to operate in the same way as a mobile crane except that unlike the latter, the load is transported safely on the twin decks. To ensure maximum speed combined with safety when travelling in reverse, the driver's cab is equipped with dual-controls and twin seats. Consequently, when the driver wishes to travel

at speed in reverse, he changes seats and faces to the rear and so avoids the usual hazards of driving in this manner.

Particularly apparent was the manœuvrability of these machines despite their size, due to the power-assisted steering and the excellent lock.

The self-loading and unloading *Traveloaders* operated by the driver only, with their speed of operation and flexibility of movement, combined with security of transportation, represent an important development in the field of mechanical handling in the steel and other heavy industries, by effecting drastic saving in space, time, labour and other equipment.

As the result of the satisfactory performance shown by *Traveloaders* in handling beams, Dorman Long (Steel), Ltd., have also decided to extend the same system to their new Billet and Rod Mills, for handling heavy parcels of blooms and slabs from the hot banks at temperatures reaching 700 deg C. For the latter purpose, *Traveloaders* of 15 tons capacity, specially modified and insulated, and with a refrigerated cab, to enable both the transporter and the driver to withstand such temperatures, are being supplied.

To conclude the demonstration, and for the particular benefit of the Executives of British Railways, and of the Port of London Authority, a *Traveloader* picked up from ground level a railway container, size approximately 24 ft long, 7 ft 4 in wide, and 8 ft high, weighing about 10 tons gross, and loaded it on to a British Road Services vehicle in a matter of minutes. Without any previous experience this operation was carried out with ease by the driver of the *Traveloader* with no other assistance, and it was interesting to note that the road space required exceeded only slightly the width of the *Traveloader*, viz. 9 ft.

An important fact which emerged from this demonstration, the first of its kind to have taken place in this country, was that the container is lifted from underneath, and not from above as in the case of cranage and that the container can be safely transported long distances, located on the decks of the *Traveloader*, at a speed of 20/25 m.p.h., completely roadworthy. Also the *Traveloader* can unload the container and load it on to, either rail wagons or road vehicles, and that empty or loaded containers can be stacked by this machine to 12 ft high in warehouses, dock sheds or goods depots, etc., thus saving valuable storage space.

Having regard to the apparent intentions of the shipping companies, and British Railways, to increase heavy container traffic in this country and for overseas shipment, it was apparent that this method of handling would make an efficient and economical contribution to this policy.

A NEW DOUBLE-DRUM CONVEYOR DRIVE

THOUGH a single driving drum is often suitable for driving a belt conveyor, in many cases the larger wrap given by two driving drums is an advantage, especially for long conveyors or where for any reason high power has to be transmitted to the belt. Ranges of both kinds of drive are made by Mavor & Coulson, Ltd., who have recently extended their range of double-drum drives by producing a smaller size, the No. 2T, of 40 to 70 h.p., for belt widths from 24 to 42 in. The path of the belt round the two driving drums is along the broken line in Fig. 4, giving the large wrap of 480 deg. The cheeks are strongly ribbed castings, joined by heavy cross stays so as to form a rigid structure preserving the alignment of the moving parts. This structure needs no baseplate or foundations but can stand directly on any floor or made-up ground, requiring only that the floor can support a bearing load of 1 ton/sq. ft., that is 15½ lb./sq. in.

As Fig. 3 shows, the motor is safely out of the way. The range is 40 to 70 h.p. and the lowest belt speed at which the driving gear can accept any of these full powers is shown by the lowest graph in Fig. 1. Motors can be either flange or foot mounted and a fluid coupling can be included. There is generally a brake for bringing the conveyor to rest when the motor is switched off without letting it go on running for too long, and for holding a loaded belt on a gradient. The brake is taken off by the thruster, at the foot on the

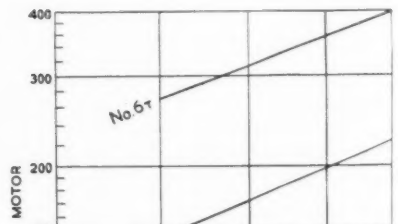


Fig. 1. The greatest power of motor that can be taken by M & C double-drum drives, depending on the speed of the belt

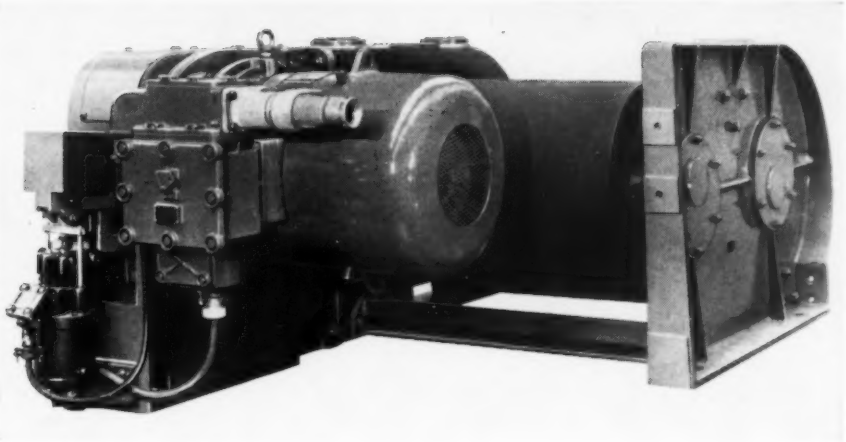


Fig. 2. No. 2T drive, brake guards removed

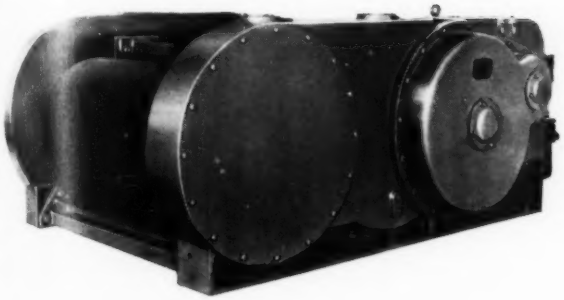
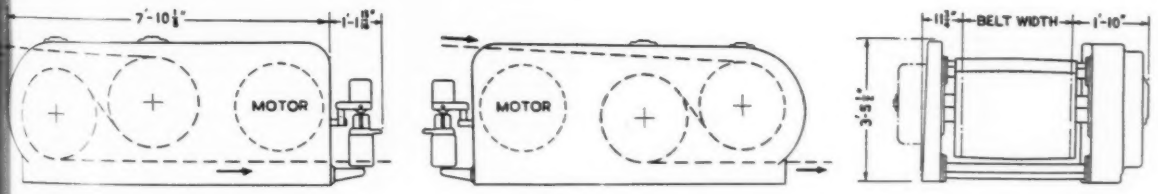


Fig. 3 (left). An M & C No. 2T drive for a 36-in belt. The gearcases are on the right of the two driving drums

Fig. 4 (below, left). The 2T drive can be installed either way round so that access can always be had easily to the gearcases. The addition is shown that the brake makes to the length

Fig. 5 (below, right). Width with brake but without fluid coupling



extreme right of Fig. 2, and it is put on by the weight seen above the thruster.

The first speed reduction is by double helical gearing, the second by straight-cut gearing with a large spur wheel on the shaft of each of the two driving drums. The teeth of the gears are made to a high degree of accuracy and run in oil almost silently. Seals protect the bearings. The diameter of the driving drums is 25 in, each of which is made of an accurately turned shell spigoted to cross-shaped plates which are welded to the shaft. Though guards are not illustrated, the belt is well guarded.

In many cases access can only be had conveniently to one side of the drive. The 2T can always be placed so that the brake and all the gearing and gearcases are on the accessible side for when necessary the drive can be turned end for end and its hand changed. The method of making the change can be seen from Fig. 4. The bearings of the driving drums are carried in eccentric housings. To change the hand, the housings are reversed, raising one drum and lowering the other. In the case on the left of Fig. 4 the belt leaves the drive under the motor; in the second case it approaches the drive over the motor.

The width of the drive is small, for on the gearcase side the greatest width is 1 ft 10 in beyond the belt, and on the other side as little as 11¾ in. These dimensions include a brake; but if a fluid coupling is also included, the motor projects about 2 in beyond the 11¾ in dimension for a 42-in belt, or correspondingly more for a narrower belt. The weight of the drive as illustrated in Fig. 2 is about 3½ tons.

TEA HANDLING AT MANCHESTER WAREHOUSE OF BROOKE BOND

By F. GRONBACK

PARTICULAR and peculiar handling problems are associated with almost every imported and manufactured commodity. Although those who are responsible for their solution have a vast background of experience upon which to draw, they generally consider that the complex conditions they have to meet are exclusive to themselves and are far from being in the category of the commonplace.

The shipment of tea in plywood chests of more or less standard sizes, if not of weight, and distributing it from a blending and packing factory sounds quite a simple sequence of operations. Only when one comes to make a detailed survey can it be appreciated how much internal transport organization is necessary to move consignments quickly, efficiently and economically.

Palletization marks a big step forward from long established routines and at the Trafford Park, Manchester Warehouse of Brooke Bond Tea, Ltd., one may compare the advantages of this system in a relatively new single storey building with a floor area of 60,000 sq. ft. over that

(Right) A portable non-mecnanized conveyor is used for taking tea chests from railway wagon

(Left) From railway siding tea chests come along a roller conveyor round a 90 deg bend to the Avery weighing machine

in an adjoining warehouse of approximately the same size where palletization has not yet been introduced, because of structural limitations.

Tea arrives at Manchester docks, via the Ship Canal and is brought by railway wagon a distance averaging two miles, to the Brooke Bond warehouse. The volume of traffic is subject to wide fluctuations because tea is a seasonal crop. From the beginning of the season, January-February, until September there is a considerable flow and then it begins to tail off. In a normal busy week as many as 20,000 chests may be received; in a quiet week as few as 2,000 and in the off-season less than that. The warehouse, however, is planned to meet optimum conditions by providing for the immediate reception of tea cargoes from India, Ceylon, East Africa and Pakistan, and occasionally consignments brought from London, and the storage of the tea to a very detailed and precise system of marking. One of the largest shipments via the Ship Canal, believed to be a record, comprised 33,000 chests of Indian and Ceylon tea in 1,650 breaks of classifications, according to garden, weight and the grades of tea indicated on the chests.

Because of the need for strict segregation, tea cannot be

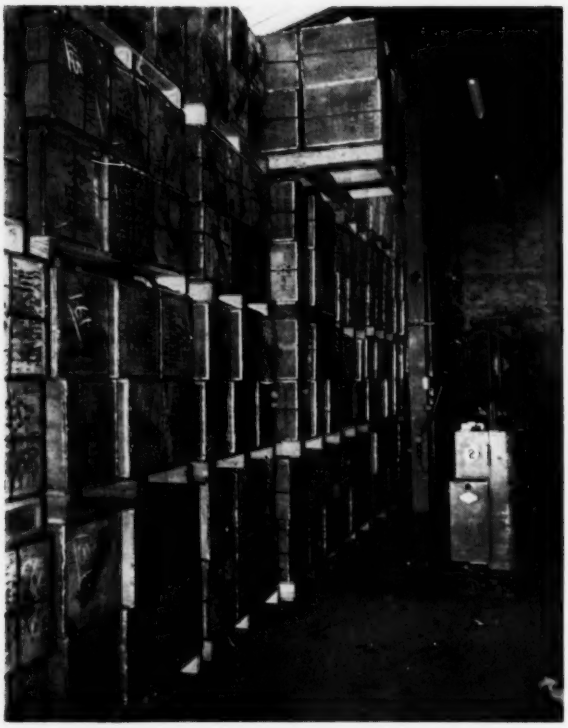
Section of chain link conveyor showing breaks or bends where chests are stored according to mark (above)

Chests are going from the old warehouse which is not palletized. Hence the use of the humper conveyor (below)

handled as a bulk commodity except in the early stages of its arrival at the warehouse where there are two railway sidings each of which can accommodate 13 wagons alongside an unloading platform. Here is the beginning of the conveyor system installed by Rownsons (Conveyors), Ltd. The total length is 1,042 ft.

The unloading bay, 200 ft long, has a heavy duty horizontal slat conveyor running at 45 ft/min from a 7½ h.p. motor. This conveyor has push-button starter and emergency 'stop only' push-button suspension stations at 20 ft pitch along the conveyor length. It is reversible to enable wagon sheets (two to each load) to be returned to the end of the loading bay where they are cleared daily by a Ship Canal Co.'s motor lorry. As the siding can handle as many as 40 railway wagons a day and each sheet is so heavy as to require two men to lift it, the reversible conveyor has obvious merit.

The dimensions of tea chests are: 16 × 16 × 20 in; 17 × 17 × 19 in; 18 × 18 × 19 in; and the standard chest 19 × 19 × 24 in. The latter may weigh anything between 100 and 165 lb. Standard chests are used to the extent of about 85 per cent of the total tea traffic. Every chest as it comes from the railway wagon—a wagon load is 50 to 80 chests—is chalked with the identification mark before it is passed from the slat conveyor on to a 40 ft long gravity roller conveyor with a 4 in pitch, which is continued by another roller bend conveyor (turning an angle of 90 deg) with guard rails fitted on the outside of the bend and a further short length to join up with a chain and free roller conveyor of 118 ft driven by a 3 h.p. motor at 1,500 r.p.m.



ABOVE:
Stacking of palletized chests by Conveyancer fork lift truck

BELOW, LEFT:
Yale 'Worksaver' hauls two trailers each with two pallets of chests

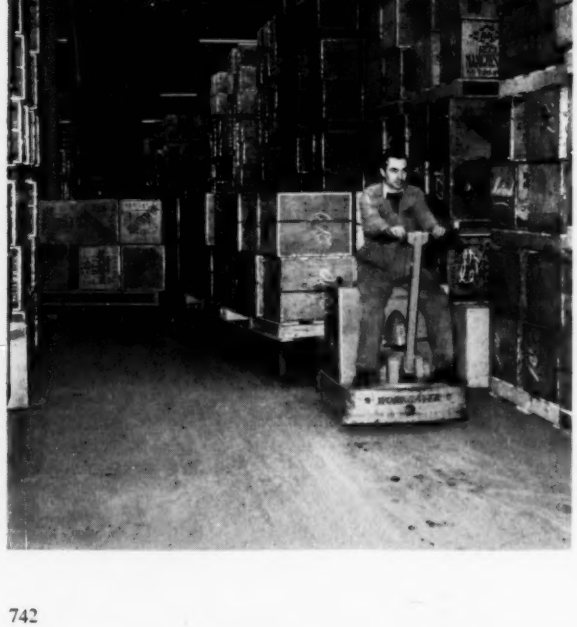
BELOW, RIGHT:
Yale 'Worksaver' is of great value in placing chests in narrow passages

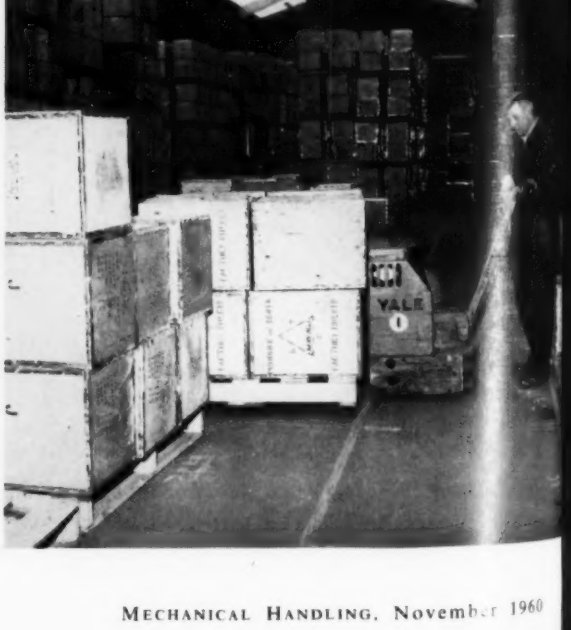
In its length, this conveyor negotiates a difference of 20 in in the floor level. The next connection is with a chain conveyor of 233 ft with breaks in the side casing at regular intervals to permit the removal of chests for storage at dumps on each side. From this position to the old warehouse there are: a roller conveyor of 60 ft, chain roller conveyors of 234 ft, humper 17 ft and a roller conveyor to the factory 100 ft.

From the conveyors, two fork lift trucks (Conveyancer Trucks, Ltd.) two electric trucks by Yale and Town (to carry pallets of 12-18 chests) a Yale tractor and four Reliance trailers take up the work of internal transport, stacking and breaking down. The trailers are designed to take a load of two pallets each. Fork lift trucks put the chests in the right beds or dumps and the tractor working with two trailers carries the tea from the warehouse into the factory. As every chest has to be placed in a designated bed, according to classification markings, the problem of sorting and storage is far more exacting than in a factory where packages are of uniform sizes and types. The exact position of any pallet and its tea is registered on a card index system for quick and easy reference.

As there are hundreds of beds, some large, some small (even very small) and the building does not lend itself to high stacking, the most economical use of the carefully plotted floor space has been achieved in this way: beds, where the pallets are stacked up to 18 ft high, are in long avenues. They are paired and each pair is separated by an 8-ft wide passage to take a fork lift truck. Between each of the two back to back beds there is a walking space of 3 ft so that every individual pallet is immediately in sight.

In the palletized warehouse, the chests are stacked on pallets in units of 6, 12 or 18, according to size. The number of pallets in use is about 4,000. They were made by the Burnley Woodworking Co. Every tea chest is treated as an individual unit. As they are stored in average lots of 24 or 36, they must be kept separate and easily accessible for delivery when needed for blending in the factory. A pallet which will hold 12 chests is considered the most convenient size.





PACKAGE UNIT MILLING FOR ANIMAL FEEDING STUFFS

A new plant introduced by W. S. Barron & Son, Ltd., is designed to produce animal feeding stuffs in the form of mixed meals, molassed meals and cubes at the rate of 10 tons per hour. A model of this system was shown at the last Mechanical Handling Exhibition, and it provides a complete unit to convey, process and store bulk feeding stuffs.

Material is delivered to a tip-in hopper with a grid at the intake. The hopper is flanged to connect to a screw conveyor which conveys the material to the main intake elevator. The elevator is of the single-leg all-metal bucket elevator type, having a capacity of 25 tons per hour. It issues material to a screw conveyor of 28 t.p.h. capacity, this conveyor is situated along the top of the storage silo, discharge to the silo is controlled by 12 rack and pinion-operated slides; pneumatically-controlled slides can, of course, be substituted.

The main storage silo comprises 12 bins, forming a nest 6 long by 2 deep and the capacity per bin is 85 metric tons, giving a total capacity of approximately 1,020 metric tons.

The conveyor also delivers material to 4 grinder bins formed in a nest of 2 long by 2 deep with the capacity for each bin being 10 metric tons, giving a total capacity of 40 metric tons. The bins between them supply two No. 5 'D'-type Barron Impact Grinders complete with pneumatic collection system.

The feed to the grinders is controlled by standard Barron rack and pinion slides, or again they can be substituted with pneumatically-controlled slides. The grinders are supplied complete with automatic shaker feeders and the pneumatic collection system comprises Primary Cyclone, No. 5 monogram fan, 12 × 12 in rotary air seal and bleadoff cyclone and atmosphere vent.

The grinder bins are also supplied with material from the main storage silo by means of a silo discharge conveyor which delivers material to the grinder bin elevator, this elevator also carries material from the tip-in at intake No. 2. The grinder bin elevator has a capacity of 22·5 metric tons per hour.

The tip-in of intake No. 3 is in the form of a Barron Rocker Intake Sieve. The intake sieve is a combination of hopper and screen, bars attached to a rocker arm sweep the complete screen area, ensuring a free flow of material through the screen at all times. Bag ties and oversize material, etc., are prevented from passing through the processing equipment and can be readily removed on shut down. The action of the rocker arm is such that oversize lumps of materials are successfully broken down.

The intake sieve supplies a bucket elevator with a capacity of 16 metric tons per hour which, in turn, supplies two screw conveyors with capacities of 21 metric tons per hour. Material upon entering these conveyors is then deposited into blending bins arranged in nests of 6 bins long by 2 bins wide. Capacity per bin is 20 metric tons, giving a total capacity of approximately 240 metric tons. There, again, in each case the individual bins are supplied through slides.

Distribution from the blending bins is made via screw worm bin dischargers to hopper-type scales. Provision is made for three such type of weighers, each with a maximum weighment capacity of 254 kilos. After weighing, the material is deposited into a secondary hopper, which delivers the material to a drag-link conveyor. This conveyor also receives concentrate additives in pre-weighed quantities from a horizontal mixer having batch capacity of 56 lb (25 kg).

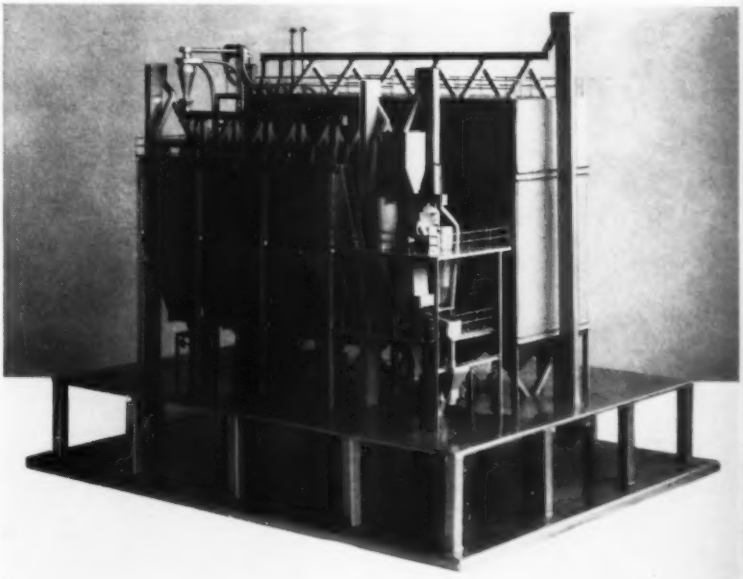
A bucket elevator with a capacity of 29 metric tons per hour receives material from the drag-link conveyor and in turn delivers to two Barron Fountain mixers. The fountain mixers outlets are controlled by slides and material is delivered from the mixer to a 45-cwt (2,250-kg) weigher bin. The route to the weigher bin is either direct by means of a screw conveyor, or alternatively to a cold molasses mixer with a capacity of 5 MT/hour at 5 per cent addition.

The weigher bin is fitted with an automatic bagging-off scale for meals. This, then, is the end of the line for material which has been delivered to the two Barron fountain mixers.

A line is inserted in the supply prior to the two fountain mixers and supplies material to a third fountain mixer. After mixing, this third fountain mixer expresses its contents to a bucket elevator which has a capacity of 29 tons per hour and elevates material to a cubing section.

A cubing section starts with a mixed meal bin with a capacity of 2¼ tons, and is fitted with a single screw bin

This model which was shown at the last Mechanical Handling Exhibition gives a good impression of the compact design of the plant



discharger with a capacity slightly in excess of the cube and pellet press.

The cube and pellet press discharges to a cooler which, in turn, discharges to the cube and pellet sieve. Cube dust and the overflow from the press is re-circulated into the bucket elevator supplying the cubing bin. The sieve discharges to a 5-cwt (250-kg) capacity weigher bin. The weigher bin in turn supplies a semi-automatic weighing off scale for the cube and pellets which are now ready for despatch.

The cooler has a subsidiary in a cooler fan and a cooler cyclone with sack-off. A molasses tank feeds the cube and pellet press via pump and meter. This same tank also has a line to the cold molasses mixer, a complete pumping and metering unit is integral with this line.

The entire plant adds up to a highly-organized and developed unit, for the supply of mixed meals, cubes and pellets. Taking into consideration the quality and quantity of output, it offers a most competitive economy.

BOOK REVIEWS

COLLIERY YEAR BOOK AND COAL TRADES DIRECTORY 1960. Published by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Size $8\frac{3}{4} \times 5\frac{1}{2}$ in. 916 pages. Cloth bound. Price 40s. net.

The *Colliery Year Book and Coal Trades Directory* 1960 is the 38th edition of the most important work of reference in daily use in the coal and allied industries. The unparalleled wealth of practical information for which the book has become famous has been comprehensively revised and supplemented where necessary. Particularly to be noted is the addition of all latest amendments to the Mines Regulations. Thorough sub-division and classification, and the personal index, ensures that information is always quickly accessible.

PLASTICS PROGRESS 1959. Edited by Phillip Morgan, M.A. Published by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Size $9\frac{3}{4} \times 6$ in. 216 pages including 21 pages of art plates and 95 text illustrations. Price 55s. net.

This book presents the technical papers read at the International Plastics Convention at Olympia, June, 1959. The papers include reports of new work on polypropylene, epoxides, crosslinking of thermoplastics, graft and block copolymers, expanded plastics and extrusion. It also contains a survey of recent thinking in the glass reinforced plastics fields, from experts in Europe, the United States and the United Kingdom. The texts of the papers are considerably longer than the versions which authors had time to present at the Convention itself.

PROCESS INTEGRATION AND INSTRUMENTATION: Electricity and Productivity Series No. 8. Published by the Electrical Development Association, 2 Savoy Hill, London, W.C.2. Price 8s. 6d., or 9s. post free.

This book, one of a series dealing with specialized industrial applications of electricity, consists of 200 pages and includes 141 specially selected illustrations. Although a number of books have appeared recently on instrumentation, control and automation, few have dealt with the necessary units of equipment which together allow various degrees of automatic working to be achieved. *Process Integration and Instrumentation* is designed to fill the gap, and has been written with the requirements of the industrial manager and production executive of the medium and small concern in mind.

A study of this new book indicates that the steps which lead from detection and measurement to indication, recording and eventually to automatic control are intricate and impinge on a wide range of specialized skills. Chemistry, physics, electrical, mechanical, electronic and nuclear engineering are involved, it is shown, all of which have their peculiar and rapidly extending vocabularies. This book outlines in simple form the means by which the variables occurring in manufacturing can be sensed, measured and controlled with the ultimate object of achieving a more completely and perfectly integrated process.

HYDRAULIC HANDBOOK 2nd Edition. Compiled by Editors of *Hydraulic Power Transmission*. Published by Trade & Technical Press, Ltd., 1-9 Tudor Drive, Morden, Surrey. 800 pages. Price £5 10s. net.

The immediate demand for the first edition of the *Hydraulic Handbook* obliged the publisher to produce this second edition within two years of the first. The new edition follows very closely the pattern of the first in style and presentation of material and data, but considerable new information and technical matter not previously published, has been included.

The volume is divided into three main sections, the first and largest occupying over half the 800 pages, setting out and explaining the basic principles of hydraulics. It goes on to survey the various items of equipment and components which go to make up an hydraulic system; and then enumerates the applications of hydraulics to industries and end-products in agriculture, aircraft, automobiles, locomotives, machine tools, presses, general engineering, mechanical handling, mining, etc., etc.

Technical data in the form of circuits, charts and tables occupy nearly 250 pages of Section 2. The third and final section comprises a Buyers' Guide connsistig of a trade names index, a classified list of suppliers of hydraulic equipment and components and an alphabetical index of manufacturers with their addresses.

The volume will be of especial value to designers and manufacturers of equipment incorporating hydraulics, users and buyers of hydraulically operated equipment and machinery and to consulting engineers and technical and research personnel.

MECHANICS OF MATERIALS. By A. Higdon. Published by John Wiley & Sons, Inc., New York, U.S.A., and obtainable from Chapman & Hall, 37 Essex Street, London, W.C.2. 502 pages. Price 62s. net.

Although essentially traditional in its organization, this book features an approach compatible with the engineering science view point. It is designed to help the reader meet the following objectives: (1) develop a working knowledge of the relations between the loads applied to a non-rigid body made of a given material and the resulting deformations of the body; (2) develop a thorough understanding of the relations between the loads applied to a non-rigid body and the stresses produced in the body; (3) develop a clear insight into the relations between stress and strain for a wide variety of conditions and materials; and (4) develop adequate procedures for finding the required dimensions of a member of a specified material to carry a given load subject to stated specifications of load and deflection.

As each new topic is introduced, an illustration is provided to help the reader visualize a physical design problem to which the theory applies. A large selection of problems is included, with special attention devoted to problems that require an understanding of the principles of mechanics without demanding excessive time for computational work.

FARNBOROUGH AIR DISPLAY AND EXHIBITION

With the development and expansion of the aircraft industry, as with all other industries, has come the increased use of mechanical handling plant and equipment. Whether it be the application of a manufacturer's standard product or equipment specially designed and built to meet a particular requirement, it will now be found in common use at the initial building of the aircraft and associated equipment, for servicing and maintenance of aircraft and airports, in the handling of freight and passengers' baggage and even in the handling of passengers themselves.

This essential contribution that mechanical handling is making towards the aircraft industry in so many spheres was much in evidence at the recent Flying Display and Exhibition organized by the Society of British Aircraft Constructors, held at the Royal Aircraft Establishment, Farnborough. Typical examples which were seen on the stands of exhibitors as well as in service in connection with this function are illustrated.

Fig. 1. Conveyancer fork truck fitted with crane arm, in general service

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Fig. 2. A Jumbo crane made by F. Taylor & Sons (Manchester), Ltd., forming part of the display by The Guided Weapon Regiment Royal Artillery

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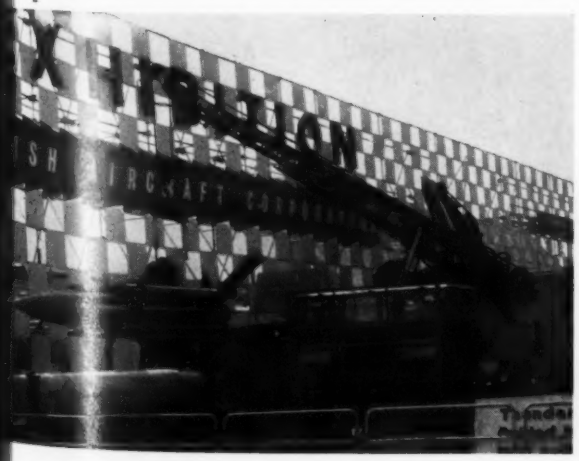

Fig. 3. A comprehensive display showing the use of Dexion slotted angle in the aircraft industry

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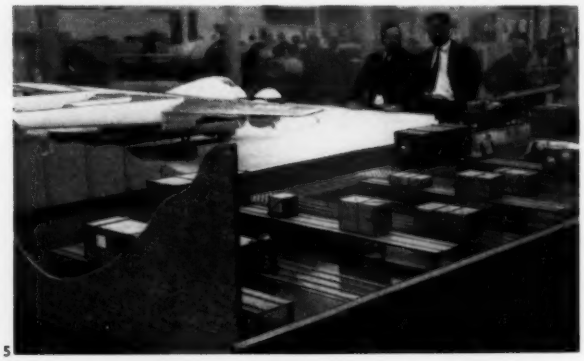

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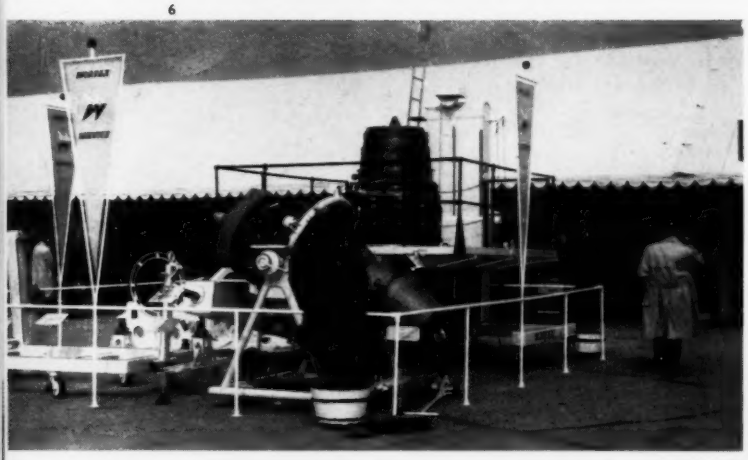

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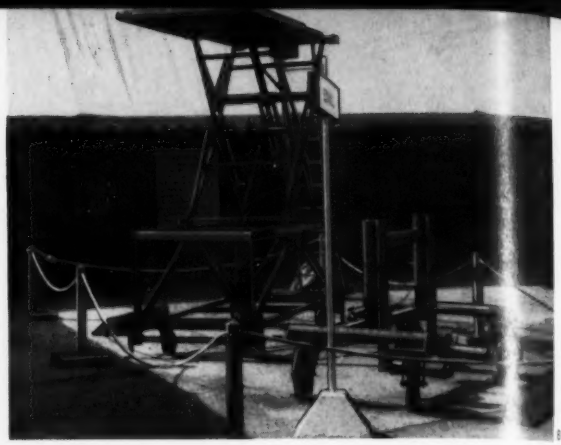

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Fig. 4. The 'Cargoveyor' shown by Salisbury Precision Engineering, Ltd., is fitted with a 20-in extendable/retractable conveyor and operates between a height of 1 ft 3 in and a maximum height of 11 ft 6 in

Fig. 5. A working model of the 'Rolamat' cargo handling system shown by Sir W. G. Armstrong Whitworth aircraft

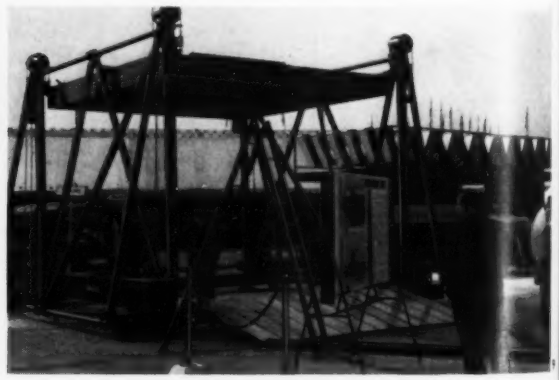
Fig. 6. Typical examples of servicing equipment by Morfax, Ltd.

Fig. 7. A Rapier travelling crane engaged in general service

Fig. 8. A wheel change dolly and elevating platform shown by H. W. Edghill & Co., Ltd.

Fig. 9. This new 'Freight Lift' has been developed by Short Brothers & Harland to meet the demands of airline operators for a fast, simple method of cargo handling. It can be employed either as a standard utility at an airport or as a transportable piece of equipment for use at bases where cargo-handling facilities are limited; 8,000 lb can be lifted to a height of 12 ft in little more than 2 minutes

Fig. 10. A multi-purpose handling trolley of 3,000 lb capacity, among the items shown by M. L. Aviation Co., Ltd.



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FÉDÉRATION EUROPÉENNE DE LA MANUTENTION

THE 8th Annual Congress of Fédération Européenne de la Manutention was held recently in Stockholm, Sweden, and was attended by about 300 delegates from many European countries including the United Kingdom.

The Association of Crane Makers was represented by 11 member firms who attended meetings of Section I—Lifting Appliances, and Section V—Mobile Cranes.

The Technical Sub-Committee of Section I has now completed the draft European Standard Specification for Cranes which will shortly be sent to member countries for comment, before final publication.

An illustrated Terminology in six languages, of the descriptions used in each country for various structural and mechanical components has been prepared, and as soon as the corrections to the proof have been made, the document will be ready for printing and copies can be obtained from either the Association of Crane Makers, at 52 Lincoln's Inn Fields, London, W.C.2, or from the Federation's headquarters at 10 Avenue Hoche, Paris VIII.

The future work of the Technical Sub-Committee will be to analyse all Safety Laws and Regulations existing in various countries with the object of compiling a document setting out the compulsory Safety Regulations common to every country and those peculiar to individual countries.

It is also proposed to plan a programme of statistical testing of cranes to find out how often various types of cranes lift their maximum load and for what periods the motions of the crane are actually running.

A special committee of Section I dealing with Building Cranes has been working on the standardization of loads,

F. S. Stent

A. Hallsworth

radii and track widths. This Committee proposes to draw up a document specifying safety devices which should be compulsory for the manufacturer to supply on building tower cranes and recommendations to the users on the correct method of using the crane with a view to preventing accidents.

Monsieur R. Pradon of France was re-elected Chairman of Section I.

The main activity of Section V—Mobile Cranes, has been the work of the Technical Sub-Committee in drafting a European standard specification for mobile cranes. This is now complete except for one or two clauses and will shortly

Some representatives of the Association of Crane Makers at a meeting of Section I. (Right to left) B. Butters (Chairman); P. M. Rambaut (Vice-chairman); J. B. Morrison and Miss B. D. Hynes (Secretaries)

be sent to all member countries for comment prior to publication.

The Section's illustrated terminology in six languages will be ready for printing within a few weeks.

Mr. A. Hallsworth of Steels Engineering Products, Ltd., was unanimously re-elected Chairman of the Section.

Section II

Section II (Continuous Conveying) of the Fédération Européenne de la Manutention also held meetings in Stockholm and delegates from Austria, Belgium, Denmark, France, Finland, Great Britain, Germany, Holland, Spain, Sweden and Switzerland were present. The proceedings were presided over by Mr. F. S. Stent (Great Britain).

Considerable progress has been made with regard to the Second Edition of the International Terminology, which will be in loose-leaf form and will be of a much more detailed nature than the first publication.

The Section is also in the process of completing its work in the production of a European Classification and Symbolization of Materials to be Conveyed, and it is contended that the document will prove to be of considerable importance to both the materials handling industry and to users of mechanical handling apparatus. All Sections of F.E.M. are, in fact, to be invited to comment on the classification.

One of the major functions of the Section is the drafting of standards at European level, and liaison between the F.E.M. and the International Standards Organization has been established.

Common ground has been achieved with regard to standardization of the more important aspects of troughed belt conveyors and other facets of this type of equipment are to be studied by the Section at its next meeting.

A formula is also being sought for the standardization of certain components of gravity roller conveyors.

The following were elected to hold office for the next two

years: *Chairman*: Mr. G. Salzer (Germany); *Vice-Chairmen*: Mr. F. Meyer (Switzerland), Mr. P. Massaut (Belgium).

The Technical Secretary of the Section is Mr. Roger Jacquot (France). The next meetings of the Section are to be held in Vienna in March, 1961.

Section IV, Industrial Trucks

At the XVth meeting held in the Grand Hotel, Stockholm, with Mr. M. N. Ramquist, Sweden, presiding, 40 delegates from 10 countries attended. The delegates represented leading manufacturers in Western Europe and by their discussions and decisions progressed the rationalization and safe operation of industrial trucks.

Mr. Russell Hastings, Chairman of the American ITA Committee on stability and safety, also attended as an observer representing the American Industrial Truck Association. The valuable work of Section IV is greatly appreciated in the U.S.A. and the ITA extend their fullest co-operation and arrange to send over a special observer to all these international meetings. Mr. Russell Hastings was able to give much valuable advice on the various matters discussed.

The objects of Section IV are to rationalize the many design features of the various makes of industrial trucks and tractors to improve still further the safety features and ease of operation and to allow for the interchangeability of the many components and attachments.

Following a discussion on the extension of the fork truck stability tests to fixed mast counter-balanced fork trucks, it was agreed to introduce immediately a recommendation that based on practical experience in Europe the existing four tests will be prescribed for all trucks having a lift height up to 12 ft with capacities up to 10,000 lbs for a provisional period of 12 months when it will be reviewed. It was reported by the Secretary that the Popular Terminology in six languages would be re-printed in an up-to-date edition which would include all new truck models, accessories and attachments.

The need for simplifying methods of rating of industrial tractors was agreed and a Sub-Committee was appointed to meet in Paris in October to prepare recommendations covering all types of electric, diesel and petrol power tractors.

The American delegate submitted formulae covering coefficients for tractors having pneumatic or cushioned tyres and was invited to attend this meeting so that a common method of rating and testing could be established. The standardization of both pneumatic and cushioned tyres was further discussed and after the British Delegation had submitted detailed advantages of the 7 × 9-in pneumatic tyre it was agreed that this size should be added to the list of F.E.M. recommended tyre sizes.

THE 'CLECO' FAMILY AND TECHNICAL SET-UP

The first in a series of reports on the manufacturers of mechanical handling equipment

G. S. Jinks, Founder; Publicity, Development and Sales Director

THE Cleco Organization established its roots 30 years ago when its product was a commercial battery-charger with a selling price of 9 gns. To-day, the selling price of many of its products is well over £4,500.

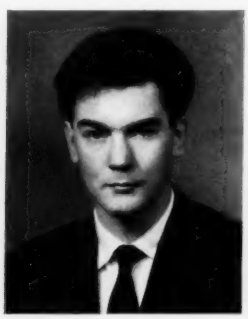
The founder, an engineer of the old school, is an inventor and, typical of many inventors, shuns organizations lest his ideas be influenced by them. When it is appreciated that many of the British vital post-war developments in the fork lift field, the straddle fork lifts, reach fork lifts, swivelling head fork lifts and side-loaders, now all available also as flameproof versions, have been, it is claimed, initiated and first produced by this company, it can be realized that an acknowledgment of these fundamental Cleco developments is now due.

Cleco has no sales promoting force, relying entirely on recommendation and a relatively small advertising programme, mainly in this journal, yet we hear that the support is now 'snowballing' to a stage almost of embarrassment. The adage of the 'beaten track to the door' holds good and for this reason, and this instance of proof, it is desirable that all manufacturers of complicated equipment which this new mechanical and electronic age demands should look to their laurels in originality, placing emphasis on design and reliability above all things. We must not disregard the fact that British designs must be better than foreign ones if we are to hold existing and competitive new foreign markets.

Cleco designs are all British and many are now protected at home and abroad by sealed patents and patents pending. We, as enthusiastic journalists, pay tribute to Cleco.

The four pictures of personalities which form the main driving force of the Cleco family are shown here. However, the founder's daughter, Miss Patricia Jinks, recently married and now Mrs. Graeme Binnie, also works with the firm on the accounting side (ex Lowther College).

David Jinks B.Sc.(Eng.) Hons. Scientific Director (ex Oundle School)



J. F. Tarry, B.Sc.(Eng.) Hons Assistant Designer (ex Loughboro College)

David Warner, Higher National; Production Manager (ex King's, Canterbury)

EUROPE OR NOT?

WOULD British manufacturers of mechanical handling equipment benefit if this country was to participate in the European Common Market? In our September issue, we published a leader on this subject entitled 'Europe or Not'. The following are replies from well-known personalities in the field of mechanical handling who, at the moment, hold office on the Management Committees of certain trade associations. The views they express are their own and they are not speaking for the Trade Associations with which they are connected.

To the Editor of 'Mechanical Handling'.
Dear Sir,
In reply to your letter, I can advise you that the Association of Lifting Tackle Makers has not, as a body, expressed any opinion on the advisability or otherwise of joining the Common Market.

However, I personally find it very difficult to form an opinion on whether any national benefits would accrue from joining the Common Market, because of the varied and conflicting opinions expressed by numerous experts, both political and non-political. The whole question is extremely complex, and I doubt very much whether the man in the street could grasp all the implications involved.

M. T. Clayton

One thing is, I think, fairly clear, and that is that if one confines one's thoughts to what effect it would have on one's own business, or that section of industry in which one is engaged—take, for example, the production of certain forms of light lifting gear, particularly electric hoists—any reduction in the present import tariffs on these goods could, in time, put the home producer in a very serious position.

Yours faithfully,
M. T. CLAYTON,
The Clayton Crane & Hoist Co., Ltd.

To the Editor of 'Mechanical Handling'.
Dear Sir,
Thank you for your letters. I have to inform you that time has not permitted me to discuss the matter personally with my colleagues on the Executive Committee of the Mechanical Handling Engineers' Association and, consequently, I am unable to reply on behalf of that organization with any authority.

The subject under review is, as you are aware, a most complex and complicated one. There are so many influencing factors and imponderables to take into account that it is difficult, even for the experts who have made a special study of the question, to forecast, with any degree of reliability, as to what would be the outcome of integration between the six Common Market countries and the Outer Seven.

It seems to me, however, that from both the economic and political aspects there is a need for collaboration within the Western European bloc. In the light of this I personally think it is just as important to the members of the Rome Treaty Organization, as it is for this country, that Great Britain should be a partner in the Common Market.

W. G. Picton

I also feel it is essential, however, that regard should be had to this country's links with the British Commonwealth countries and I think this is a fact which should be recognized and accepted by the present parties to the Rome Treaty Organization.

Participation in a Free Trade Area of the kind envisaged would, of course, present certain problems in the initial stages and of necessity would have to be solved through a policy of readjustment. Nevertheless, I feel that with the goodwill of all concerned none of these problems is completely insoluble.

I should like to emphasize that the opinions I have expressed are of a personal character and do not necessarily reflect the views of the M.H.E.A. nor of my own company.

Yours faithfully,
W. G. PICTON,
International Combustion Products, Ltd.

H. F. H. Shields

To the Editor of 'Mechanical Handling'.
Dear Sir,
I have your letter regarding the Common Market. My Association, that is the Aerial Ropeways Association, gave their views on the Common Market some time ago. Speak-

ing specially at that time I remember distinctly making this statement:—

'I am for International co-operation on every occasion where it is possible to co-operate. I would play ball with any country who was willing to play ball with me, but insist first of all that we all play under identical rules. In co-operating with various countries in the past Britain has been let down because the terms of payment including the period over which payment is made and how it is measured have usually had some point of distinction which is invalidated or blunted by matters which otherwise had been agreed. I have spent my life in trying to rub out frontiers'.

Yours faithfully,
H. F. H. SHIELDS, O.B.E., M.I.Mech.E.,
Consulting Engineer.

To the Editor of 'Mechanical Handling'.
Dear Sir,
As President of the British Industrial Truck Association it would be quite impossible for me to give unanimous views of its members as this is a subject on which opinions vary widely.

Speaking for Lansing Bagnall, Ltd., who are, of course, concerned in the manufacture of industrial trucks, I think it would be beneficial for Britain to join the Common Market. Such a move, in our opinion, would be a prelude to a much wider development in a completely Free Trade Area, and we would then visualize membership consisting of all 17 European nations.

Trade for us within the Commonwealth has often been influenced in the past by 'Imperial Preference', but this has lost a lot of the meaning it used to have.

Of the total of some 6,500 industrial trucks exported by Britain in the three years ending December 1959, nearly 30 per cent was absorbed by the present 'Free Trade Area' (i.e. Norway, Switzerland, Portugal, Denmark, Sweden, Austria) and the 'Common Market' (i.e. Italy, West Germany, Holland, Belgium, Luxemburg, and France). This 30 per cent divides in roughly equal proportions, with a slight edge in favour of the Common Market. This slight edge is, in our opinion, likely to grow—the industrial activity in the Common Market is somewhat bigger, and will grow yet bigger than the total activity in the 'Free Trade Area'.

The largest market for industrial trucks will always be in areas where there is a high concentration of industrial activity, supporting a large population at a high standard of living, such is the Common Market to a greater degree than the 'Free Trade Area'.

Bilateral trade agreements between Britain and other nations are likely to become less fashionable. These and the accompanying quantitative restrictions which they usually embrace will frequently frustrate any sales development of a market. At least they will limit any such development. The removal of artificial barriers to trade such as the Common Market mandate proposes will tend to make strong countries still stronger, and strong companies still stronger.

In a completely free trading community in which tariff and quantitative barriers are removed, we feel sure that the Industrial Truck Industry ought to be able to hold its own anywhere in the world, and, therefore, any tendency to a removal of trade barriers would, in our opinion, be only to our betterment.

Finally, if Britain were not to decide upon joining the Common Market, any share in the growing demand for industrial trucks in that Sector could only be achieved if we were to engage locally in manufacture. Such a development could necessitate almost duplication of the U.K. manufacturing, the output of which would have to carry all the production and administration overheads attendant upon such a venture. Surely this would be far less efficient than an expansion of the headquarter activity, which membership of the Common Market would encourage.

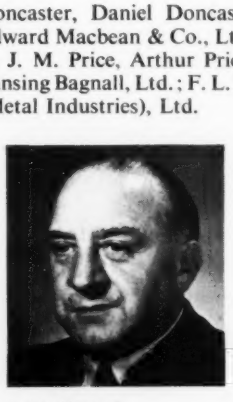
Yours faithfully,
JOHN R. SHARP,
Lansing Bagnall, Ltd

NEWS OF PERSONALITIES

One of Britain's experts in light engineering and the automobile industry takes up a new post to advise on factory planning and industrial development at home and abroad. He is **Ernest W. Hancock, O.B.E., M.I.Mech.E., Hon.M.I., Prod.E.,** of Coventry. He has joined Production-Engineering, Ltd. as an associate consultant.

For 10 years Mr. Hancock was a director and general manager of Humber, Ltd. Recently he was special projects director of the Humber company and the Rootes Group manufacturing division.

The Government of Western Australia is making a determined effort to bring the advantages and facilities of their country to the knowledge of British industry and commerce. To this end, they have recently selected a team of 10 British executives who visited Western Australia and were given every assistance to see as much as possible of the commerce and industrial possibilities of the State within the 10 or 12 days that they were there. The team comprised: J. O. Knowles, Metal Industries, Ltd.; Harold Wincott, *Investor's Chronicle;* M. H. M. Arnold, Bowmans Chemicals, Ltd.; D. J. W. Boag, Rockweld, Ltd.; R. T. Doncaster, Daniel Doncaster & Sons, Ltd.; John Glen, Edward Macbean & Co., Ltd.; M. J. Noone, Whessoe, Ltd.; A. J. M. Price, Arthur Price & Co., Ltd.; John R. Sharp, Lansing Bagnall, Ltd.; F. L. Turnbull, Armstrong Whitworth (Metal Industries), Ltd.



E. W. Hancock

C. F. Hewlett

E. Boydell & Co., Ltd., manufacturers of the Muir-Hill range of dumpers, loaders and shunters, announce the appointment of **C. F. Hewlett** as sales representative for the

East Anglia area. Mr. Hewlett, who has been Boydell's service engineer in Scotland for the past 10 years, succeeds **E. Kavanagh.**

J. J. Vilven

D. G. Anderson

J. J. Vilven has been appointed Massey-Ferguson's industrial manager, Marketing Division, United Kingdom Operations. Mr. Vilven graduated from the Capital City College, Topeka, Kansas, in business management in 1934. Between 1944 and 1955 he was manager with a number of implement dealers with whom he gained a wide experience of all farm products.

In 1955 he joined Midwestern Industries, Wichita, Kansas, as regional sales manager and when this company was acquired by Massey-Ferguson Inc. in 1957 he was appointed regional sales manager for the western half of the United States with the Massey-Ferguson Industrial Division, Wichita. In 1959 he became general sales manager.

D. G. Anderson, a director of Rownson Conveyors, Ltd., has been elected to the executive committee of the Mechanical Handling Engineers Association in place of C. W. Allin. As mentioned in our September issue, Mr. Allin recently resigned from the committee of the association.

P. Lavender

A. Perry

Denison Deri, Ltd., the company recently formed to market Deri Sine and Denison Hydraulic Equipment in Great Britain, announce two new appointments to key positions. **Paul Lavender** has been appointed chief engineer and **Arthur Perry** becomes sales manager, both positions being responsible to the Board of Directors.

Leslie Parker, the 35-year old managing director of Anderston Clyde Engineers, Ltd., has just embarked on a tightly scheduled seven-weeks American business tour. It is the second time this year that Mr. Parker has crossed the Atlantic in a quest for new business, in addition to trips to India, Africa and most European countries.

H. W. Gregory has resigned from the Board of Rownson Conveyors and commenced business on his own account as Gregorys Technical Services. This company is acting as agents for Henry Lees the crane and wagon tippler manufacturers of Motherwell, the North Acton Conveyor & Elevator Co., Ltd., and Andrews & Platt (Engineers), Ltd. The address of Gregorys Technical Services is 8 Nicholas Gardens, Ealing, London, W.5. Telephone No. Ealing 5245.

To launch their big new expansion programme, the directors of Whitlock Bros., Ltd., announce the appointment of **Frank Wilson** as public relations officer to the company.

Frank Wilson, well known in the civil engineering and construction equipment industries, was previously with Michigan (Great Britain), Ltd., and Taylor Woodrow (Building Exports), Ltd.

G. H. Marchant (general manager) has been elected to the board of the Fafnir Bearing Company, Ltd. His title will now be director and general manager. Mr. Marchant, a former works manager of Fischer Bearings Co., Ltd., joined Fafnir Bearing Co., Ltd., as general manager in January 1960. Prior to this he had been works director of Sentinel (Shrewsbury), Ltd., and general works manager of Joseph Sankey & Sons, Ltd.

L. Parker

F. Wilson

Richard Sutcliffe, Ltd., announce the appointment of **Malcolm Brocklesby** as district technical manager for the West Midlands Division of the National Coal Board. Mr. Brocklesby was born in Sheffield in 1932. He was educated at Oundle, Jesus College, Cambridge, and Sheffield University. At Cambridge he gained an M.A. degree in mechanical sciences and at Sheffield a B.Eng. degree in mining engineering. In 1953 he joined the National Coal Board as a directed practical trainee; in 1958 he was awarded his colliery manager's certificate and became an Associate Member of the Institution of Mining Engineers.

Dewrance & Co., Ltd., announce that **M. J. Verey** has resigned from the board and **Sir Donald Perrott, K.B.E.,** is appointed director and deputy chairman.

G. H. Marchant

M. Brocklesby

The Goodyear Tyre & Rubber Co. (Great Britain), Ltd., announce the appointment of **J. L. Mumby** as financial director and secretary in succession to **W. R. Booth,** who has returned to the United States as an assistant treasurer of the parent Goodyear Tire & Rubber Company in Akron,

Ohio, and treasurer of the subsidiary Goodyear International Corporation.

A native of Jersey City, New Jersey, Mr. Mumby was formerly secretary-treasurer of Goodyear-Peru.

E. H. Black, chief engineer of the Midlands Division of the Marco Conveyor & Engineering Co., Ltd., has now been appointed chief engineer to the company. He will now be based in the head office at Rowin Works, Leytonstone, London instead of in Birmingham as hitherto.

G. P. Robertson

G. P. 'Robbie' Robertson has been promoted assistant manager, sales department, for Caterpillar Tractor Co., Ltd. In his new capacity he will assist **E. W. Doubet,** sales manager, in the administration of all phases of the sales activities of the company.

Mr. Robertson has been associated with Caterpillar equipment since 1946, when he was appointed assistant sales manager for the Birtley Co., Newcastle. The Birtley Co. was at that time manufacturing Caterpillar scrapers, bulldozers and other products under licence, and he helped pioneer the sale of British-built Cat equipment.

On October 27th, **John R. Sharp** of Lansing Bagnall, Ltd., left for a visit of the U.S. and Canada, accompanied by the company's joint managing director, **John Dolphin.** It is their intention to pay visits to many of the American

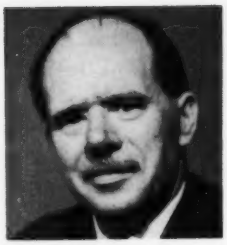
(Left) J. Dolphin

(Below) J. R. Sharp

truck manufacturers and also to get an up-to-date picture of the latest use and application of industrial trucks on the American continent.

Such a visit of course with manufacturers is very much a two-way exchange, as the Americans are usually as eager to obtain information from leading British manufacturers as we are from them. They will also be visiting their associate company in Toronto to give what assistance they can—hoping to return to the U.K. before Christmas.

F. Parker has been appointed export sales manager of Bray Construction Equipment, Ltd., Feltham, Middlesex.



W. Muir

F. Parker

Mr. Parker will be responsible for the promotion of sales of all Bray plant and equipment overseas and will maintain direct personal contact with clients and agents.

Bray Construction Equipment, Ltd., also announce the appointment of **W. Muir** as London manager. Mr. Muir was previously with the Caterpillar Tractor Co., Ltd., first in Leicester as parts promotion manager, and latterly as manager, London office. Before joining Caterpillar he was, from 1951 to 1955, stores and purchasing officer with British Road Services, Leicester/Northants District.

Michael Clark, director of the electronic and equipment group of The Plessey Co., Ltd. announces the appointment of **George A. Smith** as commercial executive of that group.

J. Handover

OBITUARY

It is with regret that we report the death of **Jack Handover.** Mr. Handover was a well known and much respected personality in the mechanical handling industry and was closely associated with developments in the industry immediately after the last war. In 1958 Jack Handover, who was a director of Railway Mine & Plantation Equipment, Ltd., and Aglo, Ltd., joined the boards of I.T.D., Ltd., who are licensed to manufacture Clark fork lift trucks etc., and All-Wheel-Drive, of London and Camberley, Surrey, who are licensed to manufacture Michigan earthmoving equipment.

Clark Equipment International, Ltd., C.A., of Buchanan, Michigan, U.S.A. have interests in both the above companies and Mr. Handover took the position of alternate director for Mr. Walter Schirmer, vice-president of Clark Equipment International, C.A. He was also a director of Finspa Engineering Co., Ltd.

Cremation took place at Golders Green Crematorium and amongst the congregation were the following persons well known in the industry: B. A. Christie (I.T.D., Ltd.); A. J. F. Andrews (Michigan (Great Britain), Ltd.); A. Gloster (Aglo, Ltd.); R. T. Barnfield (Mercury Truck & Tractor Co., Ltd.); Col. Bullen (F. Taylor & Sons (Manchester), Ltd.); C. A. Remfry (Finspa Engineering Co., Ltd.); H. A. Collman (*Mechanical Handling*).

Mr. Handover, who was 60 years of age, leaves a widow to whom we express our deepest sympathy.

REVIEW OF NEW EQUIPMENT

LOW-PRESSURE CARTRIDGE RELIEF VALVE

The Fluid Regulators Corporation, 313 Gillette Street, Painesville, Ohio, U.S.A., have produced a new low-pressure cartridge relief valve that permits precise control of pressurized fluids. When installed in a single body or a multi-valve manifold, it simplifies circuitry and can be easily removed without disconnecting lines. It is chatter-free, direct-operating and has a 10 to 500 p.s.i. operating range.

For precise control of pressurized fluids, this low-pressure cartridge relief valve has recently been produced by the Fluid Regulators Corporation, Ohio, U.S.A.

Specific operating pressures are covered by three pressure ranges. Final adjustment within a particular range is made by an external adjusting screw, and the design permits field pressure adjustment to meet particular operating conditions. Weighing only 6 oz, the valve is of stainless steel and anodized aluminium and will handle all fluids compatible with material used in construction.

NEW ALLIS-CHALMERS TRACTOR SHOVEL

The new Allis-Chalmers HD.G6 1½ cu. yd. tractor shovel is now available in this country. It has a 79·5-h.p. diesel engine, producing a 16,670-lb drawbar pull, four forward speeds from 1·5 to 5·5 m.p.h. and two reverse speeds of 2 and 4·1 m.p.h. The dumping height is over 9 ft, 13 in greater than the previous model, and the reach 3 ft 9½ in at 8 ft. The curved bottom bucket tips back 40 deg at ground level, with 21,500-lb breakout force at the cutting edge. The hydraulic shovel control system incorporates a gear-type pump mounted at the front end of the engine crankshaft, eliminating universal joints and drive shaft. All hydraulic lines and hoses are equipped with re-usable fittings for simplified, low-cost replacement. A new sand-deflecting pusher-type fan is driven from a double sheave on the timing gear shaft, and the fan belts can be replaced without disconnecting the hydraulic pump connections.

The operator has a foam-padded arm-chair-type adjustable seat, and the conveniently placed controls include a 24-V push-button for starting, decelerator pedal and built-in bucket level indicator. All-round visibility is afforded, with an uninterrupted view of bucket operations, due to the new forward down-sloping engine hood, and of the work area at the rear. The weight is distributed by long six-roller tracks, and the taper roller bearing wheels, idlers and support rollers, which are lubricated during assembly, require no further greasing. New heavy-duty track guiding truck wheel guards prevent any tendency of the tracks to jump the truck wheels or sprockets while turning and bridging. Tru-Unit construction permits removal and replacement of major assemblies without disturbing adjacent parts. Rear-mounted equipment includes hydraulic ripper and backhoe, and front-mounted attachments a rock bucket, rock fork, light materials bucket, lift tongs, lift forks, crane hooks, and straight and angling type dozers. These are mounted by knocking out and replacing four pins.

The new machine is handled by Mackay Industrial Equipment, Ltd., Faggs Road, Feltham, Middlesex.

Uninterrupted all-round visibility for the operator is a feature of the new Allis-Chalmers 1½ cu. yd. tractor shovel

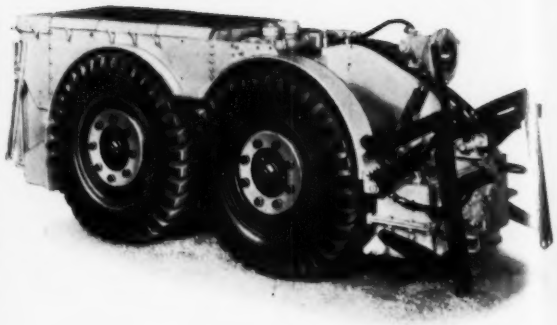
CASTOR WHEEL TYRES

The new Revvothane tyre material for castor wheel and lift truck rollers is said to have ten times the life and four times the load-carrying capacity of rubber, due to its greater tensile strength, hardness combined with resilience and security of its bonding to metal. Its tensile strength is about 5,000 p.s.i., so that metal swarf, nails and similar litter cannot penetrate and become embedded in the surface. Abrasive action, which would remove 100 cu. mm. of best-quality rubber in a unit of time, will, it is said, remove only 30 to 40 cu. mm. of Revvothane. Unlike natural rubber, the necessary hardness is produced without the aid of fillers. Standard Revvothane tyres are 92 B.S.D., though any hardness from 65 to 95 deg can be produced. Elasticity is retained, even in the very hard grades, and resilience under heavy load is said to be equal to that of a soft rubber tyre under light load.

Revvothane can be bonded to most metals, is unaffected by contact with oil and fat, is highly resistant to aromatic motor fuel and aviation kerosene, its water absorption is nil and, as it is unaffected by ozone or oxygen, it never ages or perishes. Tyres can be used in temperatures from −20 deg to 120 deg C, without damaging effect or loss of abrasion resistance. It is found by test that a load

Comparing the wear-resistant condition of Revvothane castor wheel tyre material with rubber tyres

The Johnson 1/20 diesel-engined ¾-yd dumper specially designed for cross-country operations



The Hunslet MT 25 flameproof diesel-hydraulic mines tractor

of 2 tons on four 8-in dia tyres gives a floor loading of only 8 cwt/sq. in.

Manufacturers are the Revvo Castor Co., Ltd., Revvo Works, Old Ford Road, London, E.3.

FLAMEPROOF MINES TRACTOR

Said to be the first flameproof tractor in service in a British colliery, the rubber-tyred four-wheel-driven Hunslet MT.25 has slew steering, affording manoeuvrability and precise control with ability to operate alongside conveyors without damaging them or pit arches. Acute corners can be negotiated, turning radius being only 5 ft 6 in, and the type of steering obviates the need for a differential lock and facilitates the use of ancillary equipment. The tractor is controlled by a throttle, forward-reverse selector and two levers, each applying brakes on a pair of wheels, all arranged so that the driver can face the direction of travel, thus facilitating steering and eliminating blind spots.

A Perkins Three 152 water-cooled 3-cylinder diesel engine, derated to 25 h.p. at 1,650 r.p.m., is started hydraulically and drives through a torque converter, epicyclic gearbox, reduction and transfer gearing, multiplate clutches and worm drives in each wheel. A Hunslet jet-type stainless steel exhaust gas conditioner ensures maximum cleansing of the exhaust gases and safe operation, even when working over undulating ground. An exhaust conditioner low-water level engine shut-off device is fitted and the whole exhaust system, including the conditioner, is waterjacketed. The gases from the conditioner are diluted with air from the fan before exhausting to the atmosphere. Lubrication is required only at 12-monthly intervals.

Any load likely to be encountered can be superimposed on the tractor as the total load capacity of the tyres is over 12 tons. Alternatively, the load can be hauled on rubber-tyred trailers or on steel skid pans which can form a baseplate for pallet loads and can also be converted into articulated trailers. The frame is designed for the attachment of hydraulic linkage to which can be fitted an angledozer, 2-ton low-lift shovel, 2-ton fork lift, crane, articulated trailer coupling or skid pan coupling. Also available are winches driven through the torque converter or by the hydraulic pump.

Principal dimensions are: Length over drawgear, 8 ft 11½ in; width overall, 3 ft 0 in.; height overall, 3 ft 5 in. Carrying capacity on top of tractor is 27,000 lb and on carrying plate, 4,000 lb. Drawbar pull at starting is 4,200 lb, at 2 m.p.h., 2,900 lb and at 4 m.p.h., 1,700 lb. With 4,500 lb load the machine can climb a maximum gradient of 1 in 3 at 1·3 m.p.h. and 1 in 5 at 3·4 m.p.h. The weight in working order is 5,500 lb.

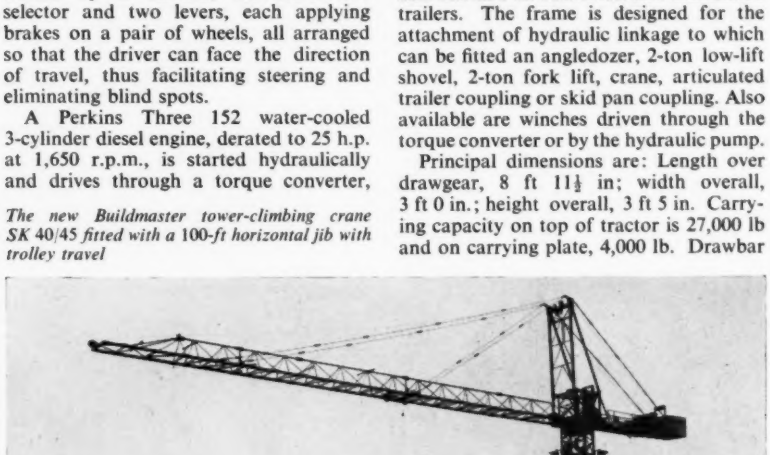
Manufacturers are the Hunslet Engine Co., Ltd., Hunslet Engine Works, 125 Jack Lane, Leeds, 10.

ARTICULATED DIESEL DUMPER

Manoeuvrability is a noticeable feature of the new Johnson ¾-cu. yd. 1-ton Model 1/20 diesel dumper, introduced by C. H. Johnson (Machinery), Ltd., Adswood, Stockport. It is powered by the AVA. IT Petter air-cooled engine. It has an articulated chassis combined with positive rear-wheel drive, Ackerman front-wheel steering, extra high ground clearance and plenty of power for good cross-country performance. A short wheelbase and big steering lock give an inner turning radius of 4 ft 3 in and outer radius of 9 ft 9 in, and the inertia of the skip does not have to be overcome as with steered skip dumpers. All steering components are of the same size as those of the Johnson 1½-cu. yd. dumper.

A 3-speed and reverse synchromesh gearbox transmits the power to the rear axle by a power grip drive, which combines long life with freedom from adjustment and lubrication attention. The drive is housed in a dust-proof casing, which is easily replaced, should the need ever arise. Of ⅜-in steel, the skip features a low front loading height and is self-tipping and returning in action. Like all Johnson dumpers, the machine can be easily converted into the Trip-Skip, giving automatic multiple-skip handling.

The new Buildmaster tower-climbing crane SK 40/45 fitted with a 100-ft horizontal jib with trolley travel



MULTI-PURPOSE CRANE

Now made available in this country by Abelson & Co. (Engineers), Ltd., Coventry Road, Sheldon, Birmingham, 26, is the Buildmaster SK.40/45 universal tower-climbing crane, which can be used as a climbing crane, fixed monotower crane or travelling tower crane and can also be equipped with a horizontal jib with trolley travel or a level luffing needle jib. It is easily converted from one of its six forms to any other.

As a climbing crane erection of a mast up to 70 ft in height can be effected normally, if space permits, or vertically with built-in

Superseding the Hydra-Digga Loadall excavator the new J.C.B.4 introduced by J. C. Bamford (Excavators), Ltd., has increased bucket capacity and power output, a five seat cab and other improvements

A Thwaites hydraulic side-discharge dumper discharging concrete at full tip whilst travelling in reverse direction on road work

tackle on restricted sites. Standard two-stage climbing gear is incorporated in all cases, but a floor frame climbing device can be supplied. Either jib can be used.

As a free-standing tower crane it can be erected to work on a prepared foundation free of external supports up to a height of 100 ft under the jib heel pen, giving a maximum height of 180 ft under the hook with luffing jib fitted. To obviate need to tie the crane to the building, the bottom 30 ft of the mast is in three heavier and stronger sections. When used as a fixed tower crane either jib can be employed.

As a travelling tower crane, the climbing crane can be mounted on a powered curved travelling undercarriage suitable for a 12-ft 3-in gauge rail track, and powered by two 7·5-h.p. slip-ring motors. Ballast bins take the place of the prepared foundation or floor wedges. Either jib can be used and, with luffing jib, a maximum height of 155 ft can be reached.

The standard horizontal jib is 104 ft long and will lift from 1¼ to 2½ tons at varying radii up to a maximum of 98 ft 6 in, the minimum radius being very close to the mast. Widely spaced fall sheaves of the travelling trolley prevent hook spin when working at great heights, and an over-hoist cut-out switch prevents the hook being raised too high and jamming in the trolley.

With the standard level luffing jib, which is 100 ft long, the crane will lift 1½ tons at maximum radius of 98 ft 6 in. Special inter-weaving of the hoist and luffing ropes results in a level luffing motion, the hook moving inwards or outwards on a level plane when the jib radius is altered.

SAVING TIME AND COST OF COAL SCREENING

The National Coal Board is cutting down the time and cost involved in screening breakage slack from singles coal at Leicestershire and Derbyshire stocking sites by using portable conveyors fitted with vibratory screening instead of hauling the coal by lorry from the sites to the pits. The Loadascreen machines used, made by Frederick Parker, Ltd., Leicester, consist of a boom-type boom on pneumatic-tyred wheels. At the discharge head of the conveyor a single- or double-deck vibratory screen separates the material into two or three sizes. Deflection plates permit the screened material to be loaded into lorries or stockpiled. Slewing wheels are available as an aid to stockpiling. Some machines working for the Board have hydraulically extended castors fitted to the tail section to make handling easier. The screen hinges back beneath the screen for travelling, and can be folded back without disconnecting the drive. Power can be provided by a petrol or diesel engine.

CONCRETE-HANDLING DUMPER

Time and labour can be saved in concrete-laying operations by the use of the new side dumper produced by Thwaites Engineering Co., Ltd., Cubbington, Leamington Spa. Although similar in appearance to a normal contractor's dumper, it provides for an hydraulically controlled side discharge from 1 ft 3 in above ground level whilst travelling under load instead of discharging into heaps which need to be levelled afterwards by hand. The operator can control positively at all times the discharge of concrete into the form and, if necessary, completely discharge the load within 7 sec without leaving his seat. The dumper has a low loading height of only 48 in, with a water level capacity of 27 cu. ft. and maximum payload of 30 cwt. It is powered by a twin-cylinder diesel engine, has a maximum forward speed of 14 m.p.h. and a turning circle of 9 ft.

IMPROVED J.C.B. EXCAVATOR

Superseding the Hydra-Digga Loadall excavator, the new J.C.B.4 announced by J. C. Bamford (Excavators), Ltd., Lakeside, Rocester, Staffs., has many improved features. It is powered by the Fordson Major 52-h.p. engine, and hydraulic power is derived from a new vane pump with output of 30 g.p.m. at 1,650 p.s.i., and fitted with a replaceable rotor cartridge. Only one size of ram, six types of hydraulic seal and three sizes of digger hose are used, simplifying the carriage of spares. Twin-ram Smoothmatic hydraulically cushioned alloy steel rack and pinion gear provides smooth slewing throughout the whole operating arc. Of about 30 per cent increased capacity, the bucket can be used as a back-acter, face shovel or square holer merely by reversing the operating direction, thus saving time and capital expenditure. Greater power availability

A Parker Loadascreen portable conveyor working for the National Coal Board

is due to the more powerful hydraulic pump and greater leverage, about 2·5 : 1, due to the dipper arm design. The design of the chassis, which contains 45 gallons of hydraulic oil, ensures adequate cooling without a cooling fan, and the J.C.B. Filtromatic filter has a filtration area of 4,800 sq. in.

The A frame has multi-position stabilizers so that the machine can be positioned over undulating or sloping ground, ensuring vertical trenching whether the ground level is horizontal or not. The frame is 16 ft wide, eliminating risk of cave-in of side walls when trenching or bulk excavating. When it is raised, 21-in ground clearance ensures ease of movement over boggy ground. The front axle has a certified rating of 70 tons.

A Spaceview cab of 160 cu. ft. capacity is fitted with upholstered seats, can accommodate five persons, including the driver, and provides an office when the machine is on site. Electrical equipment may be fitted for trafficators, normal road lighting and flood lighting in either direction. Equipments available range from 8-in taper ejector buckets for land drainage up to 6 ft., 1-cu. yd. skimming buckets and other items for special applications. Square holes can be dug with any of the buckets fitted owing to the design of the operating linkage.

COLLAPSIBLE BULK CONTAINER

A collapsible intermediate size bottom-opening bulk container for chemical powders, flakes etc. has been introduced by the Dyestuffs Division of Imperial Chemical Industries, Ltd., Imperial Chemical House, Millbank, London, S.W.1. Known as the Bowmic, this container is constructed of 3 × 3 in 5 s.w.g. Weldmesh Ref. No. 35, manufactured by the B.R.C. Engineering Co., Ltd., Stafford. It is capable of carrying half to three-quarters of a ton of material in a large two-ply paper liner, is comparatively cheap in cost, collapsible for return empty and can be conveniently handled by pallet or fork truck.

Hitherto, emptying has been the greatest difficulty with this type of container. To overcome this, a unique type of sliding closure in the base allows the contents to be dropped easily in the quantities required. The photograph illustrates the container now in use for free-flowing products, and work is proceeding on the development of a container for use with products of a less free-flowing nature.

December

Among the feature articles this issue will contain the following:—

London's New Travolator

Handling in a Shirt Factory

Automation in a Biscuit Factory

Traction Batteries

and usual features

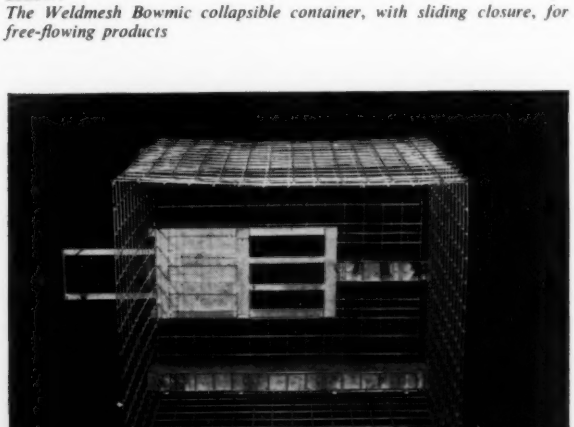
IMPROVED DUST COLLECTOR

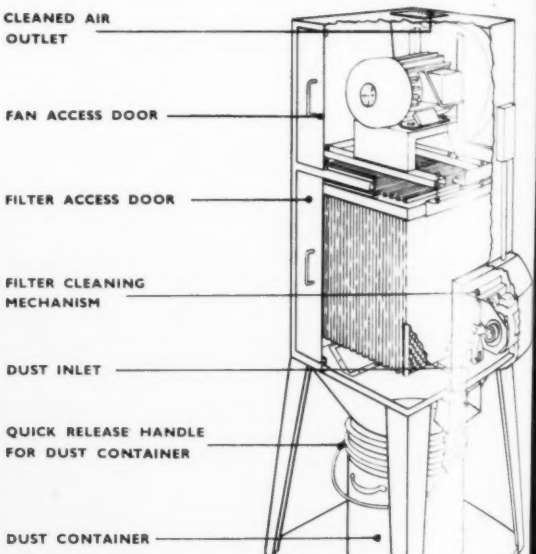
The new Unimaster dust collector replaces the Dustmaster produced by Dallow Lambert & Co., Ltd., Thurmaston, Leicester. It is available with 70 sq. ft. filter cloth area and fan capacity ranging from 0 c.f.m. at 6·2-in water gauge to 765 c.f.m. at 3·3-in water gauge. Of internally-stiffened sheet steel construction to withstand external pressures of over 12-in water gauge, it has flush fitting doors, spring catches and rubber sealing to prevent air leaks, and a 6-way terminal box, permitting various types of electrical control gear to be used. The readily removable filter element consists of pads in a common frame sealed from the fan chamber. The assembly is self-locating and removed by disconnecting the mattress linked to the shaking mechanism and releasing four nuts. Filter pads are available in materials to suit the dust handled, and enclose special inserts forming the heart of the air-cushioned cleaning system.

The inserts consist of a flexible rust-proof mesh mounted in a rigid frame. They are oscillated by an $\frac{1}{8}$-h.p. motor and an eccentric, causing the mesh within the frame to move rapidly backwards and forwards, inducing an air current in a reverse direction through the filter fabric, removing all accumulated dust. At the press of a button the filter is ready for a further period of service. Alternative control methods are available. The cleaning mechanism operates so long as the button is depressed or, in automatic form, cleaning is carried out on a pre-set cycle when the fan motor stop button is depressed. The built-in fan handles only cleaned air which is discharged upwards to avoid draughts. An acoustic duct is

(*Continued on page 757*)

RIGHT:
Showing the main features of the new Dallow Lambert Unimaster dust control unit
BELOW:
The Weldmesh Bowmic collapsible container, with sliding closure, for free-flowing products





available when noise suppression is required.

Available in two sizes, 2 cu. ft. and 4 cu. ft., the dust container is sealed to the unit by special quick-release mechanism operated by a handle. By using an over-centre cam-operating device, the handle has only to be raised and will remain in the release position without catches or clips. The container can then be removed, emptied and replaced, and re-sealed by lowering the handle.

HOPPER LEVEL SWITCHES

Two level switches have been developed by Firth Cleveland Instruments, Ltd., Treforest, Glamorgan, designed to shut off the flow of granular or semi-solid material into a hopper, bunker or silo when the level reaches a height predetermined by their mounting position. For open hoppers, Type HS 1017/1 consists of an aluminium alloy housing which is mounted on the wall or sloping floor of the hopper, with the inside face sealed by a strong synthetic rubber diaphragm. Pressure of the material on this diaphragm displaces a spring-loaded plunger which actuates a single-pole change-over micro-switch to open or close a circuit for alarm or control purposes. The sealing gasket of the switch chamber cover gives weather-proof protection, and the diaphragm seals the working parts against dust and liquid.

The Firth Cleveland type HS 1017/1 level switch for controlling the flow of granular materials into open hoppers

Type HS 1017/2 is for use in enclosed bunkers where the diaphragm may be exposed to a pressure differing from atmospheric, and changes in pressure on it might cause spurious operation of the switch. To enable the switch to distinguish between the pressure of the material and the abnormal air pressure in the hopper, the latter is fed also to the back of the diaphragm and so becomes self-balancing. For this purpose the actuating plunger is provided with a seamless metallic bellows seal and the back pressure is fed to the diaphragm through a Firth Cleveland Type PT 1033 pressure bulb transmitter mounted in the hopper roof. This contains a synthetic rubber pressure bulb shaped in the form of a piston with a flexible membrane around its periphery. Changes in hopper pressure are transmitted by the bulb via small-bore tubing connecting the transmitter to the back of the level switch diaphragm. This ensures that operation of the switch is independent of variations in the air temperature in the sealed system due to ambient conditions.

PIPE-LAYING WINCH

Besides being extremely portable, the all-steel pipe-laying winch produced by C. H. Johnson (Machinery), Ltd., Adswood, Stockport, is said to possess very substantial advantages over shearlegs and block and tackle and is far less costly than a mobile crane. It consists of two tubular and one fabricated steel legs. On the latter is built a two-speed winch with machine-cut gears, ratchet and pawl and a hand brake. With it, pipes can be raised, lowered, positioned and placed with minimum time and effort. It also has uses in factories, garages and wherever weight has to be raised or lowered.

A Johnson No. 4 pipe-laying winch in operation

TRADE NOTES

David Brown Expansion in India

David Brown plans to manufacture tractors in India have been given new impetus by the Indian Government's decision to allow the British company to build up to 3,500 tractors a year—nearly three times the output permitted under the initial manufacturing licence granted last year. The initial licence, which covered the manufacture of only the 14-h.p. David Brown 2D, has now been amplified to cover manufacture of the latest David Brown 850 and 950 Implematic tractors, of 35 h.p. and 42·5 h.p. respectively.

Manufacture will be carried out by David Brown Mahindra Tractors (Private), Ltd., a company jointly owned by the U.K. company, David Brown Tractors, Ltd., of Huddersfield, and its Indian distributors, Mahindra & Mahindra, Ltd., of Bombay.

A new factory is now being built near Bombay to undertake production of the three types of tractors and implements. Until these premises are ready, part of the existing Mahindra & Mahindra plant is being utilized for assembly and distribution.

C. H. Johnson (Machinery), Ltd.

C. H. Johnson (Machinery), Ltd., Contractors' Plant Division, announce the appointment of the following sales and service agents, for the territories specified.

Somerset, Dorset, Devon and Cornwall:
Pannell (Plant), Ltd., Torre Hill, Plymstock, Plymouth, Devon. Tel.: Plymstock 2518.

Monmouthshire, Glamorgan, Carmarthen, Pembrokeshire, Brecon, Radnorshire, Cardiganshire:
Gould Plant Hire, Ltd., Eastern Drydocks, Newport, Mon. Tel.: Newport 72461.

Gloucestershire and Wiltshire:
West Plant, Ltd., 6-8 Cambridge Street, Wells Road, Bristol, 3. Tel.: Bristol 75511.

Full stocks of Johnson dumpers, pumps, concrete vibrators and rammers are maintained by the above agents and a comprehensive stock of Johnson spares together, with the services of fully-skilled service engineers are available. Deliveries of new machines will be made from the agents into the respective areas mentioned.

$100 Prize for Martonair Sales Manager

An international fluid power contest is sponsored each year by *Applied Hydraulics and Pneumatics* (Industrial Publishing Corp., U.S.A.). This year the fourth prize of $100 was awarded to A. M. Salek, sales manager of Martonair, Ltd.

Mr. Salek, who has been with Martonair for 10 years, spent some time developing the Martonair business in New Zealand before coming to Britain. His paper described 'The Cascade System', a universal method of deriving pneumatic, hydraulic and electrical circuits.

'600' becomes Registered Trade Mark

The figures 600 have now been registered as a trade mark. For some 40 years past hundreds of thousands of people, at home and overseas, must have seen these numerals on plant, machinery and other products, on vehicles, on notice boards, in advertisements and in printed publicity; but only last month they were duly accepted as a registered trade mark applicable to George Cohen, Sons & Co., Ltd. Most of its associates in the George Cohen 600 Group will be registered users of the mark.

The fact is the Trade Marks Office is rightly cautious about the registration of purely numeral marks. It is true that in the past such numerals as '4711' for Eau de Cologne, '57' for the products of Messrs. Heinz, and '555' and '333' for State Express cigarettes have been accepted. But

absolutely convincing evidence is required that purchasers of the goods being marketed would associate the actual figures with the trading activities of the concern seeking to register the mark—in whatever typographical form or design those figures might appear.

In the case of George Cohen's and its associates, the necessary evidence was readily forthcoming from some hundreds of firms who testified accordingly. These firms represented a very wide cross-section of industry.

600

The origin of the '600' mark is by no means obscure. It is derived simply from the fact that, back in 1876, some 42 years after the firm's establishment, the headquarters of George Cohen, Sons & Co., Ltd., transferred to 600 Commercial Road, London, E.14, where, incidentally, the company still maintains an office block, warehouses and a large wharf. Thereafter people within the organization began not unnaturally to talk and write about 'going to 600'; over the years the habit spread to many concerns in the metallurgical and engineering industries, and in the early 1920s the figures were first used as a mark on goods and on publicity of various kinds.

Change of Address

P. C. & C. K. Chase, Ltd., have recently moved to a new premises, the address of which is as follows: Oyster Lane, Byfleet, Surrey (tel.: Byfleet 46951).

Rapid Expansion

In December 1958, the Mechanical Handling Division of Teleflex Products, Ltd., moved from their Chadwell Heath factory to new premises, with a total area of approximately 25,000 sq. ft., at Basildon, Essex, adjacent to their Remote Control Division.

It was estimated at the time of purchasing the land that extensions to the new premises would be necessary and now, a very short time afterwards, expansion of the works and offices totalling nearly 17,000 sq. ft. has been put in hand involving a new bay to be added to the works, covering an area of 10,800 sq. ft., and an extension to the existing office block providing a total area of 1,600 sq. ft. which will be built along the front of the factory.

The factory bay will house several new machines, including a 100-ton capacity press brake, weighing 9 tons, additional welding plant, drilling and grinding machines, a guillotine and shotblast cleaning equipment, as well as a 3-ton Matterson travelling crane with a span of 40 ft. and a downshot run of 270 ft., as used in the existing bays. At the back of the new bay will be a heavy steel store, 4,500 sq. ft. in area.

These extensions, due to be completed by January 1961, were necessitated to cope with the ever-increasing demand for Teleflex products.

Move to London

Dewrance & Co., Ltd., announce that the complete manufacturing and sales facilities of their subsidiary company, Jones Tate & Co., Ltd., Victory Works, East Parade, Bradford, electrical manufacturing engineers, are being transferred to London. All communications on and after that date must therefore be directed to Dewrance & Co., Ltd., Jones Tate Division, Great Dover Street, London, S.E.1.

Clearing Polluted Beaches

Oil pollution along wide stretches of beach at popular South Coast resorts has been concerning authorities for some time, and measures are to be adopted to clear affected areas.

The illustration shows experimental work being carried out by the Bray 450 TF tractor shovel, one of the range of hydraulic loading shovels manufactured by Bray Construction Equipment, Ltd., Feltham, Middlesex. The four-wheel drive of these models has proved particularly successful, giving ample traction on the loose shingle.

The method normally adopted is to carry the polluted shingle down to the water's edge at low tide where it is naturally washed by the sea. Alternatively, the affected shingle is buried in a trench.

Yale open Swiss Branch

Yale & Towne International, Inc., has completed arrangements to establish a branch office at Zug, Switzerland, near Zurich, it has been announced in New York by Elmer F. Franz, vice-president and treasurer of the corporation. Mr. Franz has just returned from Europe.

Mr. Franz also announced that Charles F. Burgman has been appointed managing director of Yale & Towne International, Inc. Mr. John O. Sewell, managing director of the British Divisions of The Yale & Towne Manufacturing Co., has been appointed a director and vice-president of Yale & Towne International, Inc. All three attended the recent board of directors meeting held at Zug.

The new Zug office came into operation on October 1st, 1960. In addition to administrative and market research functions, it will be responsible for promoting on a world-wide basis the sales and service of a wide variety of materials handling equipment and lock and hardware products manufactured by The Yale & Towne Manufacturing Co. The company has manufacturing plants or licensed manufacturers in the United States, Canada, Great Britain, Germany, France, Italy, Spain, Australia, Chile and Egypt. The trade mark Yale is registered in 80 countries.

Conference of the Institute of Materials Handling

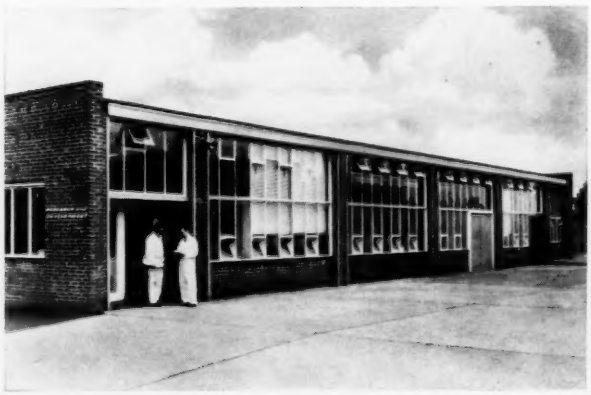
In May 1959 the Institute organized a conference on the theme 'Material benefits through Materials Handling'. The success of the conference was such that the Council of the Institute has decided to arrange a second International Conference on the theme of 'Materials Handling as a co-ordinating stimulus throughout Industry', and has decided that the venue on this occasion should be Southport and the dates from Wednesday, May 10th, to Friday, May 12th, 1961.

It is felt that in running these confer-

(*Continued on page* 759)

The new Dallow Lambert Research & Development block, Thurmaston, Leicester. The activities of this department are exclusively directed to the improvement of existing designs of the company's dust control equipment and to the development of new ideas. This section, which is additional to the existing laboratory and demonstration departments, is completely self-contained.

Below: A Bray 450 *TF tractor shovel clearing a stretch of polluted beach*



ences the Institute is providing a forum for the international exchange of knowledge and experience in this important field for the general benefit of all countries participating. The aims of the Institute are threefold:—

1. To promote the recognition of materials handling as a science and to encourage the study and development of international handling techniques.
2. To establish and maintain educational and training facilities which will ensure a higher standard of professional qualification on occupational competency among its members and will build up from the student stage a large body of competent materials handling men to the benefit of industry in general and themselves and their employers in particular.
3. To provide a common meeting-ground and forum of opinion for the free interplay of knowledge, ideas, and experience in the subject of materials handling.

This stone crushing, screening, washing and storage plant made by Frederick Parker, Ltd., of Leicester, England, replaces a similar plant which has been dismantled to make way for the Central Electricity Generating Board's Drakelow 'C' power station near Burton-on-Trent. When this station is completed in five years' time it will be one of the largest single stations in Europe. The station will be of 1,500 mW capacity

New Vistas for the Fork Lift Truck

Although the fork lift truck plays a vital and acknowledged role in British industrial life to-day, its activities in the agricultural sphere are by comparison less well known and on a much smaller scale. That this will not be the case in future years was well indicated recently when R. G. Joyce, a prominent Norfolk farmer, invited Coventry Climax, Ltd., to demonstrate one of their fork lift trucks handling grain at his farm near Fakenham. The occasion was a visit by the Anglia Television cameras to Mr. Joyce's Hall Farm to compile a programme for the 'Farming Diary' series.

Mr. Joyce, who handled the commentary himself, had as his main theme the storage and handling problems on his property. He stated that he initially used storage bins on his farm, but had found these unsuitable for varied reasons, prime among them being the lack of ventilation suffered by the grain when stored in this way. Accordingly he had returned to his original practice of storing the grain in sacks. In doing this he was, unfortunately, once more faced with the old problems of storage and handling. His storage units had multiplied from three bins into hundreds of sacks.

Mr. Joyce then introduced the Coventry Climax truck, saying that he felt this might be the answer to his problems. A. Boileau, driving an IGDA diesel-engined version of the company's 'Universal' range, demonstrated the vehicle's capabilities before the cameras. The truck lifted with ease two dozen sacks of grain, together with several packets of fertilizer, weighing a total of 25 cwt. Features of the fork lift truck, with its exceptional manœuvrability, were illustrated in the demonstration. A representative of Coventry Climax gave details of the attachments available to make the truck fully suitable for agricultural work.

The whole project gave the impression that new vistas will open up for the fork lift truck within the next five years. The coming of the combine-harvester to English fields was the first sign that agriculture could attain the increased production levels and economies resultant from

Heart of the £5½ million Hyde Park Corner–Marble Arch improvement scheme are these huge aggregate bins and batching plant which produce all the concrete for the mammoth project. It would take three men, working eight hours a day seven days a week, over nine years to load the 15-ft-high bins with the 100,000 cu. yd. which the scheme will swallow up. Two Weatherill 'Hi-Tip' hydraulic shovels make light of the task, loading twice as much in one hour as a team of men in a day. These 'Hi-Tip' loaders have a discharge height of 16 ft with a 15 cwt load and have a scoop crowd action for faster and easier loading

Designated the 2HHCR 'Hi-Tip', this model supersedes the 2HH and brings to the task of feeding extra high hoppers the additional advantages of scoop crowd action. Despite its high reach, the 2HHCR travels and can be garaged under 8 ft 4 in. The machine is powered by a Fordson Major diesel engine developing 44 b.h.p. at 1,800 r.p.m. The project, being carried out by Cubitts Fitzpatrick, Shand, is expected to be completed in the autumn of 1961

Mr. Joyce (foreground), a Norfolk farmer, sees how easy it is with a fork lift truck

Demonstration of the latest earth-moving equipment and bulk handling equipment taking place in front of new extension of Whitlock Bros., Ltd.

mechanization. The fork lift truck may soon become as familiar a sight on the agricultural landscape as it is within the factory.

£700,000 Contract for Australia

An order worth about £700,000 for electrical equipment for a new rod mill has been obtained by the Heavy Plant Division of Associated Electrical Industries, Ltd., from the Broken Hill Proprietary Co., Ltd., Australia. The mill will be driven by direct-current motors ranging in output from 600 to 2,500 h.p., and the total power available will be 17,700 h.p. Mercury-arc rectifiers, rated in all at 13,000 kW, will supply the mill motors. Switchgear, control gear, auxiliary drives and other equipment are included in the order.

Most of the electric control equipment required will be manufactured in Australia by Australian Electrical Industries (Proprietary), Ltd. Responsibility for manufacturing the rest of the equipment will be divided between the Rugby and Manchester (Trafford Park) works of A.E.I.

London Office

Strachan & Henshaw, Ltd., mechanical handling plant engineers, of Steelhoist Works, St. Philips, Bristol, 2, have recently opened a London office at Room 351, Victoria House, Southampton Row, W.C.1 (tel.: Chancery 2250). P. A. Denning has been appointed as manager of the office.

Wolverhampton Firm Secure Agency

The famous Seeger malting equipment, including the revolutionary new Wanderhaufen germinating plant system, is now available in Great Britain. The German company, C. Seeger Maschinenfabrik, Stuttgart, have officially appointed Aldersley Engineers, Ltd., Wolverhampton, the grain handling and storage specialists, as their sole agents in this country.

This agency agreement will embrace the existing Aldersley Equipment in such a manner that Aldersley Engineers, Ltd., will be able to undertake a complete malting process installation.

Burtonwood open South African Agency

It is announced that Burtonwood Eng. Co., Ltd., have entered into an agreement for selling and distribution in South Africa of their oil seals.

J. H. Vivian & Co., Ltd., of Johannesburg, are responsible for stocking and selling all varieties of oil seals made by Burtonwood and used in industrial applications.

The Burtonwood Engineering Co., which last October was acquired by U.S. Industries Inc. (Great Britain), Ltd., also manufactures oil-well drilling equipment, plastics machinery, air compressors and tail-lifts for light and heavy vehicles.

Whitlock Demonstrations

During a week of 'open house' entertainment by Whitlock Bros., Ltd., well over a thousand guests toured Whitlock's Great Yeldham works examining extensions and witnessing demonstrations of a big new range of equipment.

Six charter aircraft, a fleet of coaches and specially reserved train compartments were only part of the detailed travel arrangements made for their guests.

Very many prominent members of the civil engineering world, Government departments and industrialists, who are

(*Continued on page* 761)

The British Industrial Truck Association recently held a dinner at the Piccadilly Hotel, the occasion being when Mr. R. J. Bunn (The Metal Box Co., Ltd.), who was the winner of the 1960 *John Morris Memorial Award Winning Essay, presented his report to the Association of his visit to the Materials Handling Course at Lake Placid, U.S.A. Mr. Bunn's winning essay 'The Industrial Truck or Industrial Necessity' was published in our August issue. Picture shows (left to right) L. S. Mathew (Matbro, Ltd.), Vice President, British Industrial Truck Association; John R. Sharp, President of the Association; R. J. Bunn presenting his report to Mr. Sharp; and T. J. Cole of the secretaries to the Association.*

The largest single order for earth-moving equipment from a British distributor placed with a British manufacturer was handed over by William R. Selwood, Ltd.—major southern counties stockists—recently. After witnessing a demonstration of Whitlock's equipment including the latest Dinkum Model '60' and '66' and new Dumper D.D. '70' Mr. Selwood wrote out an order for machines valued at well over £250,000. The photograph shows Mr. A. Carleton Whitlock, managing director of Whitlock Bros., Ltd., receiving the order from Mr. William R. Selwood, managing director of William R. Selwood Ltd.

turning to mobile plant for bulk materials handling, were present. Visitors were also surprised to note that in addition to a large range of earthmoving machinery and agricultural equipment, Whitlocks have a large section of their works devoted to fully equipped dredger barge construction. A new fibre glass shop has been constructed and its development will play a big part in the future design of Whitlock products.

A series of demonstrations of earthmoving machines was staged during the week under the most rugged and testing conditions.

Subsidiary Company to be Formed

The Sheffko Ball Bearing Co., Ltd., announce that they are considering the formation of a subsidiary company with the main purpose of developing the company's activities in technical and manufacturing research. The new company would be located near Irvine in Ayrshire, Scotland, where, subject to the satisfactory conclusion of present negotiations, it is intended to construct a factory with facilities for manufacturing production tools, equipment and some of the specialized machine tools used in the manufacture of ball and roller bearings. It is not, however, the intention of the company to reduce the present toolroom activities at Luton; on the contrary, it is hoped to develop these facilities still further. In addition it is intended to house at Irvine certain auxiliary departments concerned with manufacturing operations which can most conveniently be separated from the main production of bearings at Luton and Sundon.

This development in Scotland will result in some contribution to the Government's policy to provide employment in that area. It is expected to result in reduced importation of certain equipment and thus make the company more self-supporting in this respect. It will probably also provide the possibility of increasing exports to associated companies abroad. The company will, of course, continue to regard Luton as its main centre of operations and large additions to the Sundon plant and equipment are already on order. Employees will be kept fully informed concerning these developments. The company intends to provide facilities of the highest standard at Irvine and will do all possible to foster the same excellent labour relations which have been manifest in the Luton factories for over 50 years.

A 12½-ton Perkins P4-powered Coles Crane operated by Whessoe, Ltd., of Darlington, works from the centre of the base of a new storage tank at the Shell Mex & B.P., Ltd., installation at Purfleet.

The crane does not leave the base until the last steel plate is ready to be welded. Part of the tank is then dismantled to allow the crane to work from outside the perimeter

PUBLICATIONS RECEIVED

Training Boys in Industry
A booklet published by The Industrial Training Council, entitled as above, with special reference to the non-apprentice, is available from 36 Smith Square, Westminster, London, S.W.1, price 1s. 9d.

H.M.C. Wheels, Ltd.
A new catalogue, entitled 'Wheels and Castors', has been issued by the above company, of High Street, Hornsey, London, N.8.

W. W. Brown & Partners, Ltd.
A leaflet describing their standard loading hoppers is available from the above manufacturers, of 72 Newman Street, London, W.1.

Owen Organization
A comprehensive film catalogue covering films issued by the Owen Group of Companies is obtainable from their Public Relations Office, Kent House, Market Place, London, W.1.

Overhead Travelling Cranes
A new leaflet produced by John Barnsley & Sons, Ltd., of Netherton, Dudley, Worcs., gives specifications of their wide range of overhead cranes. They also supply a more comprehensive manual giving fuller details.

Ransomes & Rapier, Ltd.
These manufacturers, of Waterside Works, Ipswich, have issued a new publication entitled Rapier Self-Priming Water Pumps.

Steel Castings
Brown, Lenox & Co., Ltd., of Pontypridd, Glamorgan, have produced a comprehensive reference book for users of steel castings, including various specifications and tables, and a glossary of metallurgical and steel foundry terms.

Spacesaver Wedge-belt Drives
An 80-page fully detailed catalogue is available from J. H. Fenner & Co., Ltd., Hull, describing the full range and stock available of their Spacesaver wedge-belt drives.

Fielden Electronics, Ltd.
The Fielden Capacipoise Servograph, fully described in their specification sheet CAP.2, is available from the company at Paston Road, Wythenshawe, Manchester, 22.

Aluminized Asbestos
Turner Brothers Asbestos Co., Ltd., of P.O. Box No. 40, Rochdale, Lancs., describe their aluminized asbestos cloth in a new leaflet, available on request.

Conveyancer Fork Trucks, Ltd.
Two new catalogues issued by the above company, of Warrington, Lancs., describe the Conveyancer Shorland 30 straddle carrier and the Flameproof FE 4-20 and FE 45-20 fork lift trucks.

Ultivee Rope Drives
Crofts (Engineers), Ltd., of Thornbury, Bradford 3, Yorks., have introduced a new leaflet entitled as above, which gives full dimensions of their range of rope drives.

Priestman News
The Spring-Summer 1960 number of this publication issued by Priestman Brothers, Ltd., describes the company's latest activities and developments at home and overseas.

Thomas Industrial Automation, Ltd.
A new leaflet entitled 'The Levolog', describing their Continuous Level Indicator, has been produced by these manufacturers, of Station Buildings, Altrincham, Cheshire.

Coal: The Price Structure
The fourth edition of this booklet published by the Federation of British Industries, 21 Tothill Street, London, S.W.1, is available, price 2s. 6d.

Aveling-Barford News
The Aveling-Barford Group have recently issued the Summer 1960 number of this publication, which details recent projects and developments of the group.

Arthur Lyon & Co. (Engineers), Ltd.
These manufacturers, of 6 Carlos Place, London, W.1, have produced an entirely new range of pumps, known as the Alcon Thames range. A leaflet describing this new range is available on request.

Rubber Improvement, Ltd.
A new technical booklet recently published by the above company, of Rilex House, Chandos Street, London, W.1, deals specifically with their 'Green Bond' conveyor belting, whilst being a general reference work on conveyor belting. Copies available on request.

Asea Journal
This journal, published by Fuller Electric Ltd., Fulbourne Road, London, E.17, includes, amongst other interesting items, an article entitled 'An Interesting Minehoist Delivery to Scotland'.

ABSTRACTS AND REFERENCES

Articles on mechanical handling published in all technical and industrial journals of the world are indexed and abstracted below. Whenever it is known, the published price of the journal containing the article is given.

The addresses of the publications concerned are given and applications for copies of the journals mentioned should be made direct.

VERTICAL CONVEYORS FOR FOUNDRIES

Mekhanizatsia (Russia). Pp. 10, 11, 12, 13, 14 and 15.

The widely used horizontal conveyors for mechanical handling of moulds consisted of moving platforms sizes from 20 × 32 in to 50 × 80 in and capacity from 0·5 to 8 ton. The main disadvantages of the equipment are the space requirements and the amount of floor area wasted in the central portion confined within the conveyor. Partial amelioration was obtained by using the above surface for storing of cores, casting boxes, etc. A considerable improvement of the floor space used was achieved by the introduction of vertical conveyors with lower and upper working branches.

The mould assembly and pouring takes place in the upper part; the cooling on the lower branch which is normally covered and provided with forced ventilation. At the end of the conveyor line the platforms move parallel to each other. When emerging from the cooling zone the moulds are being tipped over the shaker. Besides the space saving, these conveyors permit to place the moulding machines as well as proceed with the assembly and pouring from both sides.

The main criticism is their relatively more complicated design and limitations of the moulds' height. The manufacture of the equipment was standardized and the main specifications of platforms given in the following table:

PLATFORMS				Max dimensions of the transported moulds			
Width mm	Length mm	Load capacity kg	Pitch mm	Height mm	Length mm	Width mm	Number of moulds per platform
500 —	680 —	250 —	750 —	150 —	450 —	400 —	7

The pitch of the platforms is one-third of the conveyor chain. The standard length of the line is 220 ft. Maximum speed is 12 m/min. The latter is controlled in steps by a 4-speed motor giving the ratios of 1, 2 : 3, 1 : 2, and 1 : 3. The above can be supplemented by a variator allowing a stepless speed regulation.

FLEXIBLE IDLER

Conveyor Idler, *Foundry*, Penton Building, Cleveland 13, Ohio, U.S.A. August, 1960. P. 95. $1.

For installation under any belt conveyor system, the idler described consists of a double spiral-shaped Neoprene roll, 3 in in diameter, moulded over a wire rope which is supported at the ends by high-capacity precision ball bearings. Its advantages include easy replacement, a smooth natural trough for the belt, corrosion resistance and a positive cleaning action as the roll flexes. It is produced in lengths of 18 to 36 in.

FAULT DETECTION ON CONVEYORS

Inspection System for Items on Conveyor Belts, *Plant Engineering*, 308 E. James Street, Barrington, Illinois, U.S.A. August, 1960. Pp. 204-205. $1.

The Atronic inspector described is a low-cost, light-sensing, electronic inspection system for detecting and removing imperfect items from production conveyor lines. It can detect imperfections that create as small as 3 per cent variation in light reflected or transmitted from the items inspected. Usable with conveyor belts up to 10 ft wide and at speeds up to 600 ft/min, it is adaptable to many processes. Applications include finding flaws in sheet metals and plastics, detecting and removing discoloured food products from processing lines and marking stains and faulty weaving in textiles.

It consists of an illumination source over the conveyor, an optical scanner, data processor to analyse the information, a control panel and power supply. Positioned above the belt, it optically scans across it at 14,000/min. Light intensity signals are then fed into the data processor which converts the light variations to digital forms. These signals energize an actuating device, designed for each particular job, which removes imperfect items or marks any flaws.

CONTROLLING BARGES

New Barge Snubber is Big Cost Saver, *Power Engineering*, 308 E. James Street, Barrington, Illinois, U.S.A., September, 1960. P. 63. $1.

Said to save thousands of dollars a year, the new automatic coal barge snubber described is a constant tension device which secures a barge to the dock with wire rope and holds it there regardless of level changes during loading and unloading or bumping from other barges. It is essentially an air or fluid tensioning device, having an extendable cable length of 26 ft. To tie up a barge, the control valve is turned to the off position, the cable loop is fixed to the barge and the control valve moved to the on position. The barge is then pulled up to the dock and held there under constant tension.

AMERICAN AIRVEYOR

They Fly Through The Air, *Factory*, 330 West 42nd Street, New York 36, N.Y., U.S.A. August, 1960. Pp. 92-94. $1.

The need for a new concept in handling is said to have become apparent at the plant in Belleville, N.J., of the Westinghouse Electric Corporation. The airveyor adopted and described in this article is likened to a gargantuan pea-shooter for transferring large quantities of small parts between the production stations and to storage. It blows thin-walled light bulb bases over 200 ft in 2 sec, and handles several millions daily. The airveyor used consists of a blower to which is attached a 6-in pipe of p.v.c. For the longest run, 130 ft across and 70 ft vertically, a 1½-h.p. blower is used. Although the light bulb bases are covered with tacky lubricant during production, they are shot directly into a washer without any sign of clogging in the pipe.

PALLET LOADING OF TRAILERS

Pneumatic System Speeds Trailer Loading and Unloading, *Automation*, Penton Building, Cleveland 13, Ohio, U.S.A. September, 1960. Pp. 78-79. $1.

In this illustrated article is described a conveyor system developed by Alvey Conveyor Manufacturing Co. for transferring pallet loads of machines into and out of a trailer in 1½ min. In a typical installation each row of pallets is supported on a pair of roller tracks extending the length of the trailer. Usually two pairs of tracks can be placed in the trailer side by side with pallets stacked two high in each row. Between each pair of tracks for a pallet row is an endless drag chain that can be driven in either direction. Normally the top of the chain is below the pallets. This section of chain rests on a hardened steel bearing plate supported by a length of flexible hose.

(Continued on page 763)

To move the pallets in a row either into or out of a trailer, a manually operated valve admits air into the flexible hose from a pressure tank. This raises the bearing plate so that the top of the chain section is lifted into contact with the bottom of the pallets. With the chain moving in the required direction, pallets are either loaded or unloaded in or out of the trailer by virtue of the friction between the chain and the pallets. Air pressure in the hose is regulated so that sufficient friction is generated to move the pallets. If they meet an obstruction, the chain slips, affording protection to the pallets and equipment.

HANDLING CARGO
Cargo Transporter in the Canberra, *The Beama Journal*, 36 Kingsway, London, W.C.2. August, 1960. P. 125. 2s. 6d.

Particulars are given of the Carron electric transporter used for loading the s.s. *Canberra*. The two after holds are served by transporters that operate through doors in the side of the ship. A horizontal boom is extended over the quay on each side of the vessel. Along it runs a carriage with an electrically driven hoist and traversing mechanism. Operation is controlled from a cab mounted on the carriage. The transporter will handle various items, including passengers' luggage and motor cars. It avoids loss of passenger accommodation, usually involved where cranes serving deck hatches are used. Loading and unloading are also simplified and speeded up, and the cargo is at all times in view of the operator in the cab.

DIESEL-ENGINED MOBILE CRANE
Demag Mobile Crane, *The Indian and Eastern Engineer*, Sohrab House, 235 Dr. D. Naoroji Road, Bombay 1, India. June, 1960. P. 337. Rs. 2.00.

For handling loads up to 3½ ton, the Demag mobile crane described is powered by an air-cooled 2-cylinder diesel engine of 31 h.p. Its travelling speed is up to 12·3 m.p.h., and it is capable of climbing up, with load, gradients of approximately 20 per cent. The slewing angle of the jib is 60 deg. A low overall height of 7 ft 7 in permits the crane to pass through low-headroom doors, and its manœuvrability and width enable it to work in narrow alleys. Outreach of the jib in horizontal position is 11 ft 6 in, and it can be telescopically extended to 16 ft 5 in. All handling movements are hydraulically operated. Other mobile cranes with load capacities of 7 and 9 ton are of similar design.

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RECENT PATENTS

The following are brief extracts of recent United Kingdom patents which we believe will interest our readers. For full details the original patent specifications should be consulted at, or bought (3s. 6d. each) from, The Patents Office, Southampton Buildings, Chancery Lane, London, W.C.2.

LIFT TRUCK
E. Danielson, of Denmark—U.K.824129.

For interior use, running on castors and pushing under a skid or platform, with lever control rotating spindles. Patent 804091 is mentioned.

CONVEYOR BELTS
Rubber Improvements, Ltd., of Wellingborough—U.K.826011.

Multiple vinyl belts with fire-resistant covers, using a warp of terephthalate and weft of natural fibre, e.g. cotton, to get the best of both, e.g. good adhesion, stiffness strength and flexibility in thinner sections than normal, suitable for troughing.

CRANE PUMP
A. L. & L. H. S. Cohen, of Melbourne—U.K. 826018.

A two-stage pump for use on crane rams to give rapid movement when no load present, but with safety control, for when laden.

TRUCK ARMS
Eastwoods, Ltd., of London—U.K.826124.

Grippers on the arms hold stacked loads, e.g. of bricks or cartons, using a spreader device.

DAVIT CONTROL
Welin Maclachlan Davits, Ltd., of London—U.K.826133.

Two ropes on a winch are driven by one motor, which handles the two loads, e.g. lifeboats, independently.

PEAT HANDLING
Power Jets Research & Development, Ltd.—U.K.826150.

Discuss an improvement for patent 745176, a wet peat breaking device using a duct and rotary cutter, to avoid kneading action, using various conveyor feeds.

DRAG LINE
Electric Steel Foundry Co., of Oregon—U.K. 826160.

The drag hitch for bucket, with superior shackle pin attachment with enlarged head abutting surface.

COLLIERY TURNTABLE
Qualter Hall & Co. Sales, Ltd.—U.K.826168.

Improvement on patent 776667 for mine tub, etc., turntable with a single lead in runway associated with multiple outlets more or less parallel initially.

DAVITS
Davits Developments, Ltd., of Edinburgh—U.K. 826201.

Design with the arm suspended at inner end by a pivoted, inclined overhead bearing with an arm arrest arrangement.

DRACONE
Esso Research & Engineering Co., of New Jersey—U.K.826301.

Method for avoiding roll when towed full, and at a length to diameter ratio of 20, by use of a keel of water, in a bag shape.

AIRCRAFT HANDLING
J. R. Sharpe et alia, of Basingstoke—U.K. 826343 4 5 6.

Patents 736586, 737163, 815752 are discussed and designs for plane wheel handling trolleys, with grip arrangements to prevent wind gusts causing upward wheel movement. In one case three arms act as grip jaws on each side of the tyre, another suggestion is for a roller supported wheel engaging a ring on the trolley, which can have chains drawn over the tyre top.

FURNACE HANDLING
York Engineering & Construction Co., of Pittsburgh—U.K. 826380 1/2

Tube, bar and rod are uniformly heated using conveyor racks with movable teeth to rotate the metal and give even heating. A series of beams acting as a lifting device are outlined.

CHIP CONVEYOR
Bahre Metallwerke K.G., of Hanover—U.K. 826399 400.

Blower and hopper arrangements to present fine chips at the surface of chipboard, achieved by passing conveyor underneath, with the fine chips falling first and last.

SKIP LOADING
Qualter Hall & Co. Sales, Ltd., of Barnsley—U.K. 826410.

Outline a form of coal, ore or debris loading into skips, via open-ended tubs which pivot on their front rail wheels down into the cage.

WORM ELEVATOR
W. S. Barron & Son, Ltd., of Gloucester—U.K. 826434.

Design with better stabilizer bearings for vertical and horizontal screw conveyors, preventing attrition and accumulation of material, by means of a split sleeve bolted together to give a pipe shape.

HOPPERS
Ballock, Ltd., of Edinburgh—U.K. 826453.

Wheel-mounted hoppers with screw elevator, used in grain handling, with baffle design at outlet to avoid jamming.

PULP HANDLING
M. J. Jalkanen-Finland—U.K. 826518.

Wood-pulp handling tower, e.g. after bleaching, with cutter blades at top of pillar of pulp being forced upwards. A screw worm feeds on to normal discharge conveyors.

CRATE LIFT
Joseph Bradbury & Sons, Ltd., of Braintree Docks, in U.K. 826551/2.

Consider patents 695386 and 724512 for a goods lifter having pairs of tracks or carriages, on grooved rollers, operated by a ram. The carriage has arms with a given system of pawls to avoid accidental release.

FILLER MACHINE
Maschinenfabrik Fr. Niepmann & Co., Westphalia—U.K. 826636/7.

Filler for cartridges with explosive powder, using conveyor worms and rotary conveyor, or chain ones to move the cases. Density is variable and the worms reverse to extract without upsetting filling.

FLAMEPROOFED ROLLER
Hanmade Conveyor Co., Ltd., of Nottingham—U.K. 826666.

Form of conveyor roller support, using two end discs and a sleeve, as an improvement on patent 772048, with a fire-resistant part between the bearing and rigid member.

SCRAPER
Evensman Manufacturing Co., of Denver—U.K. 826684.

Scraper for accurate levelling of land, using three truss sections, the aim being to avoid hollow gouging at turns. The blade frame is suspended from the middle truss, with ground engaging wheels raising or lowering the frame.

GLASS CLEANING
Libbey Owens Ford Glass Co., of Toledo—U.K. 826702.

Roller conveyorized washing and cleaning plant for glass, using sound waves.

SHRIMP TAILING
W. Henning, of Hamburg—U.K. 826711.

Prawns etc., are de-shelled by cutting with rapid drying to give easy removal of brittle remnant, using machine assists of cutters and graters, acting on conveyorized feed.

ROPE SLING
H. Meisen, of Augsburg—U.K. 826765.

To avoid cutting into load corners, and also rope wear, resilient blocks are slid into position to space the rope properly.

CAN WRAPPING
Atlanta Paper Co., of Georgia—U.K. 826839/40.

Machine for tightly wrapping cans, etc., fed by conveyors, somewhat as per patents 822411, 790815, using a single paperboard blank to hold a staggered line of cans after scoring and folding, with triangular apertures and hinged flaps holding the open-ended complete package.

PLATE CONVEYOR
Deamg A.G., of Duisburg—U.K. 826857.

Pit mining, troughed, jointed-plate conveyor, chain-driven, with aim to avoid damage at load stations, by resilient ring supports for the rollers.

GRAB
Chaseside Engineering Co., Ltd., of Hertford—U.K. 827950.

Form of mechanical shovel scoop with upright side walls, bent in at the lower edges, and holding bifurcated welded teeth, with a strengthening plate underneath.

CONVEYORS
Geo. W. King, Ltd., of Stevenage—U.K. 826972.

Load trolley etc., propelled by fixed track and pusher dogs, using a form of free running round curves, by oscillating supports, somewhat as an improvement on patent 822927.

CABLE LAYING
H.M.P.G., of London—U.K. 826974.

Submarine cable-laying means for dealing for rigid-repeater sections, using a complex pulley arrangement, which works even if the ship is not fully stationary and a moveable carriage to by-pass the pulleys with the rigid part.

CONVEYOR-HEATER
Pittsburgh Plate Glass Co., Pennsylvania—U.K. 826984.

Arrangement for sheet annealing using small railed cars passing through moveable furnace side sections.

WHEELED TROLLEY
Allen & Hanburys, of London—U.K. 82699

Surgical table which moves in any direction as a trolley, with fixed wheels at one end and castors at the other.

ROLLER SUPPORT
Fisher & Ludlow, Ltd., of Birmingham—U.K. 827002.

Design of flexible idlers for belt conveyors, somewhat as per patent 816605, simple to adjust to various trough section shapes, using eccentric location on the trunnions.

DRUM TIPPLER
British Petroleum Co.—U.K. 827007.

Tipper used in filling, etc., bitumen and oil drums, by an L-shaped cradle which is pivoted and allows drums to roll off, including an automatic return to load feature.

TRACTOR LOADER
David Brown Industries, Ltd., of Huddersfield—U.K. 827038.

Form of power-operated loader for rock and soil, light excavation or bulldozing, using pivoted arm mounting which can overload if desired.

PILE DRIVING
A. B. Akermans Gjuteri & Mek Verkstad, of Sweden—U.K. 827131.

Attachment for crawler crane, using a windlass frame as a turntable house, attached to the main chassis. A given form of driver head is outlined and the whole is moveable on the tractor and trailer.

PROOFER BOX
N. V. Haags Bakkerij Machine Fabriek Arnold Kalmeyer—U.K. 827136.

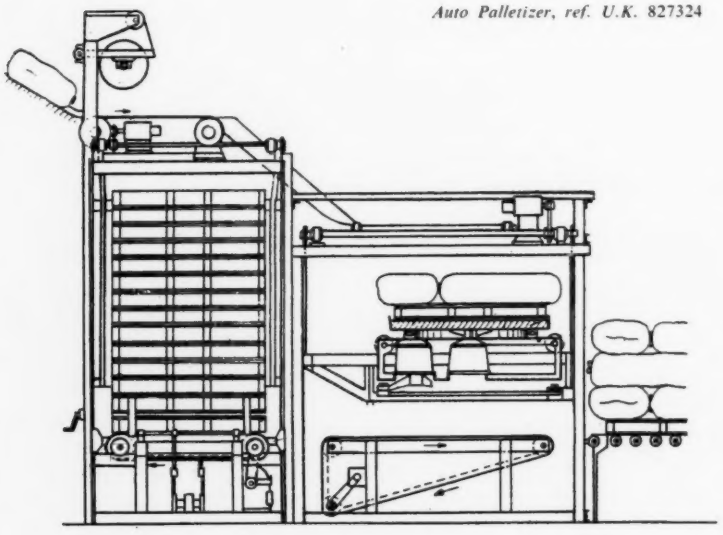
Bread dough conveyor for medium-sized bakeries, using trays pivoted between chains, with stepwise feed, only when dough lumps actually fall into a pan, the whole set-up being smaller and cheaper than usual.

AUTO PALLETIZER
M. Droward, of France—U.K. 827324

Way of uniformly distributing, say, four sacks per layer, on a pallet, maybe having six layers, at about 20 pallets per hour, with conveyorized feed of pallets, which are rotated.

TIPPING TRAILER
S.E.B.M.A. Co., of Chartres—U.K. 8[illegible]345.

Form of coupling and tipping for two-wheeled trailers to tractors, giving a jib arm, draft bar and deformable linkage, for dealing with the problem of the centre of gravity being forward of the wheels.



Auto Palletizer, ref. U.K. 827324